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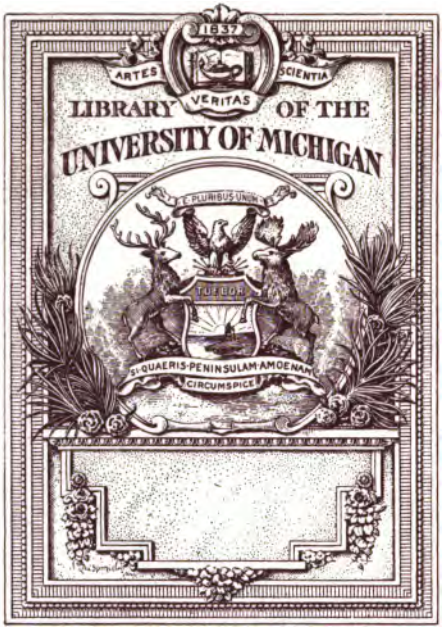

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Shropshire yearling ewe Fox's 1680.—First in Class and Sweepstakes in every show where exhibited.
Property of A. O. Fox, Oregon, Wis.

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TRANSACTIONS

OF THE

WISCONSIN

State Agricultural Society

TOGETHER WITH PAPERS PREPARED FOR PUBLICATION BY PROMINENT AGRICULTURISTS OF THE STATE.

VOLUME XXXII.

COMPILED BY

JOHN M. TRUE, Secretary.

MADISON, WIS.:
DEMOCRAT PRINTING COMPANY, STATE PRINTER,
1894.

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LETTER OF TRANSMITTAL

To his excellency, GEO. W. PECK,

Governor of the State of Wisconsin:

The State Agricultural Society, in deference to the claims of the World's Columbian Exposition, decided to hold no fair in 1893. The sequel showed that this action was well taken. As a result, the financial transactions, herewith transmitted, are mainly limited to the office expenses, and claims of routine work. In the place of the papers and discussions usually gathered from the winter convention of the Society, the secretary has solicited papers, upon leading agricultural topics, by practical agriculturists and stockgrowers of the state, which are hereby presented for publication.

The present outlook for the Society is highly encouraging; and with the coming season we anticipate a most successful re-opening of our State Fair work.

Very respectfully yours,

JOHN M. TRUE,

Secretary.

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Ackerman, Philip..	Milwaukee.	Beck, C. A.....	Milwaukee.
Adams, H. C.....	Madison..	Becker, Wash'ton.	Milwaukee.
Adams, L. L.....		Becker, Edward..	Milwaukee.
Adams, James.....	Janesville	Beckwith, S.....	Dartford.
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Alder, E. D	Milwaukee.	Bement, E	Oregon.
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Anderson, Matt...	Pine Bluff.	Bergenthal, Wm.	Milwaukee.
Anderson, E. M....	Hartland.	Best, Jr., Chas ...	Milwaukee.
Andrus, L. E.....	Milwaukee.	Bigelow, F. G....	Milwaukee.
Angell, R. R.....	Janesville.	Bigelow, Wm ..	Milwaukee.
Angell, Wm. H....	Sun Prairie.	Billings, Earl.....	Madison.
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Arnold, A. A.....	Galesville.	Bird, T. E.....	
Asmuth, Anton....	Milwaukee.	Birkel, F. G.. .	Milwaukee.
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Atkins, A. H.....	Milwaukee.	Black, John.. ..	Milwaukee.
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Auer, Louis.....	Milwaukee.	Bliss, C. M	
Auerbach, S. B....	Milwaukee.	Bostwick, J. M ...	Janesville.
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Babbitt, D. H	Auburn, N. Y.	Bonnell, Lansing.	
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Bartlett, O. Z.....	Milwaukee.	Boynton, A. L....	Milwaukee.
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Brown, Rudolph M.	Wauwatosa.	Chase, Clifford....	Milwaukee.
Brown, Thos. H...	Milwaukee.	Chase, Geo. H ..	Milwaukee.
Brown, Wm. W...	Merton.	Chase, Lucien D..	Milwaukee.
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Bunde, Louis W...	Milwaukee.	Colladay, W. M ..	Stoughton.
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Carlton, W. D. ...	Sun Prairie.	Crawl, Jno.....	Center.
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Demore, A. B.....	Chicago.
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Dexter, Chas. J....	Milwaukee.
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Fisher, Seth.....	Center.
Fisher, S. W.....	Center.
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French, Jonathan.	

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Gibbs, Charles R...	Whitewater.
Gilbert, Thomas...	Oregon.
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Gilligan, John.....	Milwaukee.
Gilman, Henry....	Sun Prairie.
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Greenman, C. H...	Dover Center, Minn.
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Hall, Augustus....	
Hall, H. P.	
Hallock, Youngs...	Middleton.
Hamilton. A. K ...	Milwaukee.
Hammond, E. S....	
Hammond. L. M...	
Hanks, A. S.....	Milwaukee.
Hansen. Guido	Milwaukee.
Hansen, John E...	Milwaukee.
Hansen, Oscar C...	Milwaukee.
Hansen, Theo. L...	Milwaukee.
Harding, George...	Waukesha.
Harris, Jas	Janesville.
Hartman. F. W....	Milwaukee.
Harvey, J. W.....	Knoxville. Tenn.
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Hastings, S. D.....	Madison.
Hatch Eugene	
Hausman, Jos. ...	Madison.
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Hawes, W. N.....	East Middleton.
Hayes, A. J.	Milwaukee.
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Heil, Jacob	Milwaukee.
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Helms, Christian ..	Milwaukee.
Hempstead, H. N..	Milwaukee.
Hendee, C. A.....	Milwaukee.
Henderson, F. W..	N. Greenfield.
Henderson. S. I....	N. Greenfield.
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Henry, W. A... ..	Madison.
Hesse, Fred.....	Milwaukee.
Heyn, Herman....	Milwaukee.
Hicks, J. H.....	Oshkosh.
Higbee, A. T.... ..	Fort Atkinson.
Hilderbrand, And..	Milwaukee.
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Hiles, Geo.....	Milwaukee.
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Hill, J. P. W.....	
Hill, H. J.....	Madison.
Hill, Robert.....	Chicago.
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Hinkley, B. R.....	Summit Center
Hinkley, Frank D.	Milwaukee.
Hinrichsen, H. L..	Milwaukee.
Hinsey, John A....	Milwaukee.
Hintze, C. F. A ...	Milwaukee.
Hirsch, H	Milwaukee.
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Hodson, C. W.....	Janesville.

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Hopkins, Jas	
Hopkins, B. B	Milwaukee.
Hopkins, E. C.	Milwaukee.
Hopkins, H. C.	Oconomowoc.
Hoskins, J. W.	Milwaukee.
Hoven, Math.	Madison
Howie, D. N.	Milwaukee.
Hoxie, B. S.	Evansville.
Hoyt, F. E.	Rochester.
Hoyt, J. W.	
Hoyt, E. D.	Wauwatosa.
Hubbard, S. D.	Mondovi.
Hudson, John W.	Madison.
Hume, Wm.	Oshkosh.
Huntley, Daniel	Appleton.
Hurlbut, E	Oconomowoc.
Hurson, John	Milwaukee.
Hutchins, C. A.	Madison.
Hutson, J. S.	Stoughton.
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Ilsley, Chas. F.	Milwaukee.
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Iverson, J. C	Milwaukee.
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Jacobs, Wm.	Madison.
Jacobs, Jr., Wm.	Madison.
Jeffrey, Geo.	Milwaukee.
Jenkins, J. G.	Milwaukee.
Jenks, S. R.	
Jenkins, J. C.	Janesville.
Jerdee, L. P.	
Jerdee, M. P.	
Johnson, John A	Madison.
Johnson, Jr., John.	Madison.
Johnson, Jos.	Hartland.
Johnson, M. B.	
Johnson, Fred J.	Milwaukee.
Johnston, R. A.	Milwaukee.
Johnston, W. A.	Minneapolis.
Johnston, John	Milwaukee.
Johnstone, Mrs. F. L.	Madison.
Johnson, C. H.	Sun Prairie.
Jones, E. D.	Fond du Lac.
Jones, John N.	Madison.
Jones, W. A.	Mineral Point.
Josslyn, E. S.	Milwaukee.
Kane, A. L	Milwaukee.
Keen, Mathew	Milwaukee.
Kellogg, Geo. J.	Janesville.
Kelly, Thos. L.	Milwaukee.
Keogh, Edward	Milwaukee.
Kerin, John	Wauwatosa.
Kern, J B. A.	Milwaukee.
Kershaw, C. J.	Chicago, Ill.
Keyes, E. W	Madison.
Kiewert, Emil.	Milwaukee.
Kimball, M. G.	
Kindling, Louis	Milwaukee.
Kingsley, Geo. P.	Janesville.
Kipp, B. A.	Milwaukee.
Kiser, J C.	Oregon.
Kiser, W. C.	Tetonka, So. Dak.
Kissinger, J. P.	Milwaukee.
Klein, Peter J	Milwaukee.
Klein, Geo.	Ft. Atkinson.
Knapp, G. A.	Fond du Lac.
Knapp, J. G.	Limona, Fla.
Knapp, Wm. A.	Fond du Lac.
Kneeland, James.	Milwaukee.
Knight, Ed.	Myrtle, N. D.
Knowles, Geo.	Milwaukee.
Knowles, Geo. P.	W. Superior.
Koch, H. C.	Milwaukee.
Koch, John C.	Milwaukee.
Kopmeier, John	Milwaukee, 120 Canal St.
Koss, Rudolph	Milwaukee.
Kraus, Fred.	Milwaukee.
Krull, Robt.	Milwaukee.
Ladd, M. L.	Mendota, Ill.
Lafeber, James	Wauwatosa.
Lamb, F. J.	Madison.
Landaur, Max	Milwaukee.
Lando, Julius	Milwaukee.
Lapham, Henry	Summitt.
Larkin, B. F.	Madison.
Larkin, C. D.	Milwaukee.
Larkin, C. H.	Milwaukee.
Larkin, Daniel	Madison
Lawrence, W. A.	Janesville.
Lawrie, James	Milwaukee.
Lawton, J. G.	De Pere.
Lazier, Ed.	Rochelle, Ill.
Learned, J. M.	
Leidersdorf, B.	Milwaukee.
Leitch, Jr. W. T.	
Leitch, W. T.	
Lennox, B. G.	Chicago, Ill.
Leslie, John	
Lester, Waterman	
Lewis, Calvin. E.	Milwaukee.
Lewis, John L	Madison.
Lindsay, E. J.	Milwaukee.

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Little, Thos. H....	Janesville.	McNeil, David.....	Stoughton.
Lockwood, John...		McPherson, J. P...	Springdale.
Lucy, O. K.....	Columbus.		
Ludington, F... ..	Milwaukee.	Meehan, James....	Milwaukee.
Ludlow, A.....	Monroe	Meehan, P.....	Milwaukee.
Luening, A. F.....	Milwaukee.	Mehl, John.....	Milwaukee.
Lull, Charles R....	No. Greenfield.	Meinecke, Jr., A..	Milwaukee.
Lunzmann, C	Milwaukee.	Meinecke, John....	Milwaukee.
Lyman, L. H.....	Madison	Meisner, C. A.....	Milwaukee.
Lynch, T. M.....	Janesville.	Melindy, Miss M. A. M.....	Milwaukee.
Lysaght, Wm.....	Monroe.	Mendel, H. M.....	Milwaukee.
Macomber, S. D...	New Lisbon.	Merrill, Alf.....	Madison.
Madden, Geo.....	Milwaukee.	Meyer, W. H.....	Milwaukee.
Mahoney, Geo.....	Milwaukee.	Millard, A. F.....	Milwaukee.
Main, A. H.....	Madison.	Miller, B. K.....	Milwaukee.
Manegold, A. F...	Milwaukee.	Miller, John.....	Milwaukee.
Manegold, Jr., Chas	Milwaukee.	Miller, Charles B..	Madison.
Mann, Andrew L..	Madison.	Miller, Roswell....	Chicago.
Mann, Curtis.....	Oconomowoc.	Miller, Fred.....	Milwaukee.
Mann, Fred M.....	Milwaukee.	Miller, Jr., B. K...	Milwaukee.
Mann, Henry.....	Milwaukee.	Millett, Charles O..	Beloit.
Mann, J. E.....	Madison.	Mills, Simeon.....	Madison.
Mann, J. G	Milwaukee.	Miner, Cyrus	Janesville.
Mannwaring, Wm.	Black Earth.	Miner, G. B.....	Milwaukee.
Marshall, Samuel..	Milwaukee.	Mitchell, G. Stanley	Milwaukee.
Martin, A. C.....	Ashton.	Mitchell, J. L.....	Milwaukee.
Martin, C. L.....	Janesville.	Mock, B.....	Milwaukee.
Martin, Nathaniel.		Mohr, Oscar.....	Milwaukee.
Martin, S. W.....		Mooney, R. D.....	Brown Deer.
Mason, G. A.....		Moore, B. F.....	Fond du Lac.
Matthews, A. R....	Milwaukee.	Morden, Edward...	Milwaukee.
Matthews, E. P....	Milwaukee.	Morehouse, L H...	Madison.
Maxon, Glenway..	Milwaukee.	Morgan, James....	Milwaukee.
Maxon, O. T.....	S. Evanston, Ill.	Morgan, Thomas..	Milwaukee.
May, A. C.....	Los Angeles, Cal.	Morrison, W. H....	Madison.
		Moxley, A. R.....	
Mayhew, F. L.....	Milwaukee.	Mueller, Louis J...	Milwaukee.
Mayhew, T. W....	Milwaukee.	Mueller, Oscar	Milwaukee.
McCarty, F. D.....	Glenn Harbor, Mich.	Mullen, James... .	Milwaukee.
		Murray, Geo.....	
McConnell, L. J...	Madison.	Myers, A. B..... .	Milwaukee.
McConnell, Wm. N.	Dartford.		
McCord, Samuel...	Milwaukee.	Nash, C. D.....	Milwaukee.
McCormack, J. G..	Madison.	Nason, S. L.....	Nasonville.
McDermott, Wm..	Fond du Lac.	Neacy, M.....	Milwaukee.
McDonald, A.....	Alloa.	Needham, J. P....	Wauwatosa.
McDonald, John...	Minneapolis.	Nelson, Cassius B..	Madison.
McDowell, H. C...	Oconomowoc.	Newcomb, S. B....	Cold Spring.
McFetridge, E. C..	Beaver Dam.	Newcome, C. W..	Milwaukee.
McGeoch, A. N....	Milwaukee.	Newton, I. S.....	Middleton.
McGeoch, P.....	Milwaukee.	Newton, T. L	Beaver Dam.
McKenna, Martin..	Madison.	Neuser, Henry....	Milwaukee.
McKerrow, Geo....	Sussex.	Nichels, L. T.....	Berlin.
McKinney, H. D...	Janesville.	Nieman, L. W.....	Milwaukee.
McLaren, W. P....	Milwaukee.	Norris, C. W.....	Milwaukee.
McLaughlin, J. H..	Milwaukee.	Norton, J. B.....	Madison.

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Nowell, W. A.....	Milwaukee.	Pierce, A. E	Milwaukee.
Noyes, A. F.....	Beaver Dam.	Pilgrim, D. T. ...	Wauwatosa.
Nunnemacher, Rob	Milwaukee.	Pilgrim, Jr., D. T.	Wauwatosa.
Nunnemacher, R..	Milwaukee.	Pinney, S. U.....	Madison.
		Pleiss, August....	Milwaukee.
Ober, R. P.....		Plumb, J. C... ..	Milton.
Oberman, Geo. J...	Milwaukee.	Plumb, D. T... ..	
Ogilvie, Robt. B ..	Madison.	Plummer, B. G. .	Wausau.
Olcott, J. B	Oshkosh.	Polzinsky, Jos....	
Olcott, John D....	Milwaukee.	Pond, Samuel A ..	Janesville.
Oliver, Joseph B...	Milwaukee.	Poppert, Geo.....	Milwaukee.
Olney, C. W	LaCygne, Kan.	Porter, G. E.....	Eau Claire.
Ormond, Wm. M..		Porter, Wm. H...	Marinette.
Orr, George H		Powers, D. J	
Osborne, W. H....	Milwaukee.	Powers, W. J...	Black Earth.
Otjen, O S	Milwaukee.	Pratt, E. E	
Ott, George V.....	Lawtey, Fla.	Pratt, Oris	Spring Prairie.
		Pres. St. Peter's Valley Farm Club..	
Pabst, Fred.....	Milwaukee.	Preucer, C	Milwaukee.
Pabst, Jr., Fred...	Milwaukee.	Prichard, Miss M.E	Janesville.
Pabst, Gustav.....	Milwaukee.		
Palmer, E. W.....	Fitchburg.	Quinn, Jeremiah..	Milwaukee.
Palmer, Henry....	Verona.		
Palmer, H. L.....	Milwaukee.	Rademacher, Wm.	Milwaukee.
Palmer, J. S.....	Baraboo.	Rawson, C. A....	
Palmer, O. M	Oregon.	Ray, Charles	Milwaukee.
Palmer, J. Y.....		Raymond, S. O....	Geneva.
Park, W. J.....	Madison.	Reed, Harrison...	Madison.
Parker, C. H.....	Beloit.	Resague, A. C....	Janesville.
Parkinson, A. C...	Columbus.	Rexford, J. D ...	Janesville.
Parmley, Ira	Center.	Reynolds, John...	Ranney.
Parsons, P. B		Reynolds, Thomas	Madison.
Partridge, Jno. S..	Whitewater.	Rice, E M.....	Whitewater.
Patten, L. F.....	Janesville.	Rich, A. W.....	Milwaukee.
Patton, Jas. E.....	Milwaukee.	Richards, Griffith.	Cambria.
Paul, Edward J...	Milwaukee.	Richardson, D....	Middleton.
Paul, John H.....	Genessee.	Richardson, H....	Janesville.
Paulson, Aug. A...	New Holstein.	Richardson, Jam's	
Payne, H. C	Milwaukee.	Richardson, R. J..	Janesville.
Payne, Wm.....	Janesville.	Richmond, A.....	Whitewater.
Peck, Geo. W.....	Madison.	Richter, Fredrick.	Milwaukee.
Peffer, G. P.....	Pewaukee.	Riebsam, C. R....	Madison.
Peffer, Miss Kate F	Pewaukee.	Riling, Geo. F....	North Greenf'd
Pember, R. T.....	Janesville.	Riordan, Chas...	
Pereles, Jas. M ...	Milwaukee.	Robbins, J.....	
Pereles, Thos. J....	Milwaukee.	Robbins, J V.....	
Perrine, L. W.....		Robinson, Geo. I..	Milwaukee.
Perry, B. F..... ..	Madison.	Robinson, Chas. C.	Milwaukee.
Petley, James.....	Milwaukee.	Roe, J P...	
Pettit, C. H.....	Milwaukee.	Rogers, C. C	Milwaukee.
Pettit, L. J.....	Milwaukee.	Rogers, C. H.....	Milwaukee.
Pfister, Chas.....	Milwaukee.	Rogers, D. G.....	Milwaukee.
Phillips, A. J.....	West Salem.	Rogers, H. G.....	Milwaukee.
Phillips, J. P... ..		Rogers, J. S.....	Burlington.
Phillips, Thomas..	Milwaukee.	Rogers, Lawrence.	
Pier, C. K	Milwaukee.	Rohlfing, Wm....	Milwaukee.
Pierce, C. L	Milwaukee.	Rosenkranz, O. L.	Milwaukee.

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Rowe, Richard W..	Modison.	Smith, E. C	Markesan.
Rowe, W. E.....	Mazomanie.	Smith, J. Morris...	
Rucker, A. M.....	Milwaukee.	Smith, M. C	Janesville.
Ruggles, J. D		Smith, S. B	Vernon.
Rusk, Jeremiah M.	Viroqua.	Smith, Winfield....	Milwaukee.
Rust, Julius.....	N. Greenfield.	Snell, H	Madison.
Rust, Newman F...	N. Greenfield.	Snyder, E. A.....	West Granville
Rust, John L	N. Greenfield.	Snyder, Fred	Milwaukee.
Ryder, James K....	Waterloo.	Solper, Chas.....	Milwaukee.
		Somers, Peter J....	Milwaukee.
Salisbury, Abraham	Milwaukee.	Spaulding, D. J ...	Black River Falls.
Salisbury, D. F ...	Oregon.		
Salisbury, R. W...	Paoli.	Spencer, J C.....	Milwaukee.
Sanborn, Jas. S....	Milwaukee.	Spencer, John C...	Milwaukee.
Sanderson, H. B...	Milwaukee.	Spencer, R. C.....	Milwaukee.
Sanderson, R. B...		Sprecher, John....	Madison.
Sanger, Casper M..	Waukesha.	Squire, Thomas B..	Waterloo.
Sarles, John H ...	Boscobel.	St. John, J. W.....	Janesville.
Saveland, John....	Milwaukee.	Stadler, J. C	Milwaukee.
Sawyer, H. W	Hartford.	Stafford, H. H.....	Milwaukee.
Sawyer, James....	Milwaukee.	Stanley, Wm.....	Vienna.
Schley, Bradley G.	Milwaukee.	Stannard, A. C....	Milton.
Schultz, H. F.....	N. Greenfield.	Stapleton, J. A....	Milwaukee.
Schœffel, Geo. J...	New York.	Stark, Chas. G	Milwaukee.
Schutter, Chas.....		Stark, Edward J...	Milwaukee.
Schweitzer, Theo..	Milwaukee.	Starke, Conrad.....	Milwaukee.
Seamans, S. H.....	Milwaukee.	Steele, Chester....	Milwaukee.
Seaver, J. E.....	Darien.	Steensland, H	Madison.
Seiben, John.....	Milwaukee.	Stelloh, Henry.....	Root Creek.
Seville, Jas.....	Lodi.	Stephenson, F. M..	Marinette.
Sexton, Wm. F....	Milwaukee.	Stephenson, Isaac..	Marinette.
Sharp, J. W.....		Stevens, J. T	Madison.
Shaw, Charles H...	Milwaukee.	Stewart, C. R.....	Carson, Minn.
Shaw, Geo. B.....	Eau Claire.	Stewart, G. H	Colorado Springs, Colo.
Shaw, J. B			
Shea, Edward.....	Milwaukee.	Stickney, Chas....	Wauwatosa.
Shea, Thomas.....	Milwaukee.	Stickney, J S.....	Wauwatosa.
Sheldon, A. H.....	Janesville.	Stilson, Adelbert...	Oshkosh.
Sheldon, D. G.....	Madison.	Stilson, Edgar.....	Oshkosh.
Sheldon, S. L	Madison.	Stockman, Jno.....	Milton
Sheperd, Clarence..	Milwaukee.	Stoltz, H. L.....	646 Island Ave. Milwaukee.
Sherman, Adelmar.	Janesville.		
Sherman, Amaziah.	Janesville.	Stone, G	Beloit.
Sherman, H. B....	Burnett Junct.	Storm, Wm	Madison.
Shipman, S. V.....	Chicago, Ill.	Stowe, La Fayette.	Sun Prarie.
Sholes, Chas.....	Milwaukee.	Street, Richard ...	Waukesha.
Simmons, C J.....	Monroe.	Sutherland, C.....	Madison.
Simonds, Wm. L...	Milwaukee.	Sutton, J. J.....	Columbus.
Simpson, E. D.....	Milwaukee.	Swain, W. W.....	Madison
Skelley, Chas.....	Janesville.	Swan, E A.....	Wauwatosa.
Skinner, E. W.....	Sioux City, Ia.	Swan, N. J.....	Wauwatosa.
Skinner, Geo. J...	Sioux Falls, S. D.	Swan, O. J.....	Wauwatosa.
Sloan, I. C.....	Madison.	Tallman, W. H....	Janesville.
Smith, A. A. L....	Milwau ee.	Taylor, E. T.....	Mukwonago.
Smith, A. E	Milwaukee.	Taylor, H. A... ..	Madison.
Smith, Angus.....	Milwaukee.	Taylor, Wm. R....	Cottage Grove.

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Tenney, D. K.....	Chicago, Ill.	Wackerhagen, E ..	Racine.
Tenney, H. A.. ...	Madison.	Waggstaff, S. M...	
Tenney, Samuel A.	Hartland.	Wagner, Julius....	Milwaukee.
Terwilliger, Jas....	Madison.	Wait, J. B.	
Terwilliger, Sid....	Madison.	Wall, E. C.....	Milwaukee.
Thayer, M. A.....	Sparta.	Walker, W. A.....	Milwaukee.
Theurer, Fred.....	Milwaukee.	Walsh, Michael....	Milwaukee.
Thom, H. C	Madison.	Warren, Fred C...	Fox Lake.
Thomas, Amos	Good Hope.	Warren, J. H.....	Janesville.
Thomas, E. P	Milwaukee.	Webster, S. R.....	Danville.
Thomas, W. H.....	Pewaukee.	Weigler, August...	Milwaukee.
Thompson, H. M...	Mosinee.	Weisel, Peter.....	Milwaukee.
Thorp, J. G.....	Eau Claire.	Weiner, Jacob.....	Milwaukee.
Thorson, John.....	Milwaukee.	Welch, William....	Madison.
Tibbits, Geo M....	Milwaukee.	Wellauer, Jacob...	Milwaukee.
Tierney, Kyron....		Werner, John.....	
Todd, J. G.....	Janesville.	West, Henry.....	Madison.
Tolford, J. W	Neillsville.	West, Henry H....	Milwaukee.
Torgerson, Lars....		West, S. C.....	Milwaukee.
Torry, R. D.....		Weston, John. ...	Burnett.
Townley, John	Moundville.	Whaling, J. M.....	Milwaukee.
Tratt, F W.....	Whitewater.	Wharton, J. S. ...	Milwaukee.
Treat, Geo. E.....	Milwaukee.	Wheeler, Geo. F...	Milwaukee.
Treat, R B.....		Wheeler, Guy.....	Janesville.
True, John M.....	Baraboo.	Wheeler, J. M.....	Wauwatosa.
Tucker, Joseph J..	Chicago, Ill.	Wheeler, L. A.....	Milwaukee.
Tuttle, A. G.....	Baraboo.	Wheelock, W. G...	Janesville.
Tweedy, Jr., J H..	Milwaukee.	Wheelwright, Jesse	Middleton.
Twining, M. S.....	Monroe.	Whitcombe, H. F..	Milwaukee.
		Whitney, W. F....	Milwaukee.
		Wicks, Thomas....	
Uihlein, Alfred....	Milwaukee.	Wightman, H.....	
Uihlein, August....	Milwaukee.	Wilcox, C. F.....	Janesville.
Uihlein, Henry....	Milwaukee.	Wilcox, C. G.....	De Pere.
Usher, Ellis	Milwaukee.	Wilkin, T. S.....	Milwaukee.
		Wilkins, A. W.....	Milwaukee.
		Wiley, O. S..	Benton Har., Mich.
Van Brunt, W. A..	Horicon.		
Vance, David.....	Milwaukee.	Williams, C. H...	Baraboo.
Vance, Frank L....	Milwaukee.	Williams, D.....	Darien.
Van Cott, Albert B	Madison.	Williams, Daniel..	Summit.
Van Etta, Jacob...	Madison.	Williams, J P.....	Madison.
Van Kirk, N.....	Chicago, Ill.	Williams, Randall.	Janesville.
Van Norman, G. B.	Milwaukee.	Williams, S. R.....	Madison.
Van Orden, J.....	Baraboo.	Wilson, Zebina...	Palmyra.
Van Schaik, I. W..	Milwaukee.	Wilson, William...	Wausau.
Van Slyke, N. B...	Madison.	Wilson, William ..	
Vaughn, A W. ..	Lodi.	Wolcott, H	Milwaukee.
Vernon, Ralph C...	Madison.	Wolf, W. H.....	Milwaukee.
Viall, Andrus.....	Madison.	Wood, J. W... ...	Baraboo.
Vilas, Chas. H.....	Chicago, Ill.	Wootton, Robert ..	Madison.
Vilas, Wm. F.....	Madison.	Worthington, B. M	
Vilter, Ernst	Milwaukee.	Wright, D. H.....	Madison.
Vogel, Fred...	Milwaukee.	Wright, Geo.....	Mt. Horeb.

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Wright, J. S.....	Emerald Grove	Youmans, C. A...	Neillsville.
Wright, Josiah T..	Janesville.		
Wright, O. W....		Zimmerman, G. J.	Milwaukee.
Wurster, Jacob....	Milwaukee.	Zimmerman, V...	Milwaukee.
Wylie, Geo.....	Leeds.	Zinn, A. C.....	Milwaukee.
Wylie, Geo.....	Elkhorn.	Zwietusch, Otto..	Milwaukee.
Yewdale, Merton H	Milwaukee.		

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Abbott, Chauncy,
Adams, Isaac,
Allen, H M.,
Allen, W. C.,
Allis, E. P.,
Arnold, J. M.,
Atwood, Chas. D.,
Atwood, David,
Ayers, J. W.,
Bacon, I. P.,
Bailey, M. T.,
Baker, R. H.,
Barnes, Geo.,
Barron, H. D.,
Barry, James,
Baxter, Geo.,
Bayley, F. W.,
Beecroft, W. G.,
Bemis, Fred,
Benedict, S. G.,
Benjamin, H. M.,
Bennett, A. A.,
Billings, H. M.,
Blair, Francis J.,
Blanchar, W.,
Blossom, Levi,
Bloomer, E. J.,
Bostwick, Perry,
Bowen, J. B.,
Bowman, J. M.,
Bradley, C. T.,
Braley, A. B.,
Briard, W. A.,
Briggs, F ,
Brodhead, E. H.,
Brown, B. F.,
Brown, T.,
Brown, J. J.,
Burnham, Geo.,
Burnham, John L.,
Bush, Samuel,
Busjaeger, A.,
Button, Henry H.,
Campbell, C. M.,
Carpenter, J. A.,
Carter, Guy,
Cary, I.,
Casar, Wm.,
Case, J. I.,
Chandler, Sam,
Chapman, T. A.,
Chase, H.,
Child, John,
Clark, C. R.,
Clark, Saterlee,
Coit, D. R.,
Coleman, W. W.,
Corey, J.,
Cottrill, J. P. C.,
Craig, A. J.,
Crocker, Hans,
Cross, J. B.,
Curtis, L. S.,
Curtis, Seymour,
Daggett, M. L.,
Daggett, S. S.,
Dahlman, John,
Davis, G. L.,
Davis, Jno.,
Davis, S. B.,
Dean, John S.,
Dean, N. W.,
Dewey, Nelson,
Dickson, J. P.,
Dodge, J. E.,
Doris, John,
Dorn, M. M.,
Doty, E. P.,
Dousman, H. L.,
Dousman, J. B.,
Drury, E W.,
Dunn, Andrew,
Dunn, Wm.,
Dunning, Abel,
Durkee, Chas.,
Durkee, H.,
Eaton, J. O.,
Elson, Chas.,
Ellsworth, O.,
Emmons, N. J.,
Enos, E.,
Fairbanks, E.,
Fernley, John,
Field, Martin,
Fifield, L.,
Fitch, W. G.,
Foote, Sidney,
Fowle, Jacob,
Fox, W. H.,
Friend, Elias,
Froedert, Fred,
Furlong, John,
Furlong, Thos. T.,
Grady, F M.,
Gernon, Geo.,
Gillett, R. E ,
Goodrich, G.,
Grant, Albert,
Grant, S. B.,
Green, Anthony,
Green, Geo. G.,
Greenman, H. D.,
Green, Samuel,
Gregory, J. C.,
Grover, E.,
Guernsey, Orrin,
Hall, S. H.,
Hanchett, A. M.,
Hancock, B.,
Hanford, A. G.,
Hanstran, Peter,
Harrington, N. M.,
Harvey, L. P.,
Helfenstein, J. A.,
Hibbard, W. B.,
Hill, P. B.,
Hiner, W. R.,
Hobart, L. J.,
Hodge, Robert,
Hoeflinger, Carl,
Holbrook, James,
Holt, David,
Hopkins, B. F.,
Hopkins, J. C.,
Hughes, Wheldon,
Hunt, J. W.,
Huntington, C. P.,
Hutson, Sol.,
Jacobs, H. C.,
Janssen, E. H.,
Johnston, Hugh L.,
Johnson, J. C.,
Juneau, Paul,
Kellogg, L. H.,
Kellogg, L. T.,
Kendrick, C. D.,
Kent, A. C.,
Kellogg, Rufus B.,
Kershaw, W. J.,
Kimbal, John,
Kingsley, S. P.,
Klauber, Samuel,
Kneeland, Moses,
Lapham, I. A.,
Larkin, W.,
Lewis, H. A.,
Luddington, H.,
Luddington, Jas. L.,
Lynde, W. P.,
Mabie, E. T.,
Macy, J. B.,
Masters, E. D.,
Matteson, Clinton,
Matts, J. H. B.,
McBride, Alex,
McCullough, Andrew,
McDill, A. L.,
McDougal, G. W.,

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McIndoe, Walter D.,
McKenna, David,
Mears, W. A.,
Merrill, S. S.,
Miltimore, Ira,
Mitchell, Alex.,
Mix, E. T.,
Morse, D. S.,
Morse, Sam'l.,
Mosely, G. F.,
Mosher, J. C.,
Nazro, John,
Newton, Ephraim,
Nott, B. F.,
Paddock, Geo.,
Paine, Geo ,
Page, H. L.,
Page H. M.,
Park, John W.,
Perkins, P. M.,
Perry, Eli,
Pfister, Guido,
Phelps, Warren A.,
Pinckney, B.,
Plankington, John,
Porter, W. F.,
Post, D. T.,
Power, D. G.,
Prichard, P. M.,
Proudfit, Andrew,
Reed, Herbert,
Reynolds, John,
Reynolds, Mich.,
Reyser, J. O.,
Richards, Richard,
Roddis, T. R ,
Rodermund, John,
Rogers, Anson,
Ross, W.,
Rowley, N. C.,
Ruble, Simeon,
Russell, Harvey,
Sage, E. C.,
Sanderson, Ed.,
Sanderson, Wm.,
Schandien, Emil,
Schutt, U.,
Scollan, Frank,
Scott, S. B.,
Seiben, John,
Sexton, Kellogg,
Sexton, L ,
Sherman, Geo.,
Sherman, J. M.,
Sherwood, J. C.,
Shipman, A. C.,
Sinclair, Jeff,
Slaughter, A. B.,
Slaughter, G. H.,
Slocum, G. A.,
Smith, Adam,
Smith, Geo. B.,
Smith, H. L.,
Smith, J. B.,
Smith, S. W.,
Smith, W. E.,
Smith, J M.,
Spaulding, Jos.,
Spaulding, Wm.,
Stannard, A. C.,
Stevens, G. C.,
Stilson, Eli,
Strong, H. P.,
Sullivan, James,
Talmadge, John J.,
Terry, F. H.,
Thomas, M. J.,
Thompson, Dr. W.,
Thompson, J. H.,
Thompson, Ole,
Throop, B.,
True, W. H.,
Utter, Joseph,
Van Nostrand, A. H.,
Vilas, Henry,
Vilas, L. B.,
Vilas, L. M.,
Walrab, Sylvan,
Warren, W. R.,
Webb, James A.,
Webster, James,
Webster, Martin,
Weed, Chas.,
Wells, D. L.,
West, A. H.,
Wheeler, W. A.,
White, A.,
White, C. W.,
White, W. A.,
Whittelsey, T. T.,
Willard, J. F.,
Williams, C. L.,
Williams, Daniel,
Williams, G. M.,
Williams, S. G.,
Wilson, H O.,
Wolcott, E. B.,
Woolley, J. T.,
Worthington, D.,
Worthington, Geo.,
Wright, N. A.,
Young, J. E.

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OFFICERS OF LOCAL

Name of Society.	President.	Post Office.
Adams County Agricultural Society	S. W. Pierce	Friendship
Arcadia Agricultural and Driving Association	Nic Lehrbach	Arcadia
Barron County Agricultural Society	W. W. Flinn	Chetek
Brown County Fair and Park Association	H. Hagemeister	Green Bay
Brown County Agricultural and Mechanical Assn	R. J. McGeehan	De Pere
Buffalo County Agricultural Society	J. T. Brownlee	Mondovi
Burnett County Agricultural Society	Peter Anderson	Grantsburg
Blake's Prairie Agricultural Society	John Carey	Bloomington
Boscobel Driving Park and Agricultural Society	Lon B. Ruka	Boscobel
Calumet County Agricultural Society	T. Oesan	New Holstein
Clark County Agricultural Society	Chas. E. Burpee.	Neillsville
Columbia County Agricultural Society	George Bain	Portage
Crawford County Agricultural Society	E. G. Briggs	Mt. Sterling
Cumberland Agricultural and Driving Park Assn	S. H. Waterman.	Cumberland
Dane County Agricultural Society	S. L. Sheldon	Madison
Dodge County Fair Association	D. Dickinson	Beaver Dam
Door County Agricultural Society	H. C. Sebser	Sturgeon Bay
Dunn County Agricultural Society	Paul C. Wilson	Menomonie
Eastern Monroe County Agricultural Society	O. M. Hill	Tomah
Grant County Agricultural Society	Delos Abrams	Lancaster
Green County Agricultural Society	G. T. Hodges	Monroe
Industrial Association of Manitowoc County	Cornelius Madson.	Manitowoc
Iowa County Agricultural Society	Thomas Thomas	Dodgeville
Jackson County Agricultural Society	E. A. Gaylord	Melrose
Jefferson County and Rock River Valley Agr'l Soc.	John Whittet	Sumner
Juneau County Agricultural Society	S. C. Plummer	Mauston
Kewaunee County Agricultural Society	Rawson Moore	Kewaunee
La Crosse County Agricultural Society	J. J. Johnson	La Crosse
La Crosse Inter-State Fair Association	F. A. Copeland	La Crosse
Langlade County Agricultural Society	Henry Peters	Strassburg
Lake Superior Agricultural and Industrial Fair Ass.	T. G. Alvord	Superior
Lafayette County Agricultural Society	John Meehan	Darlington
Little Baraboo Valley Agr'l and Fair Assn	E. Blakeslee	Ironton
Lodi Union Agricultural Society	S. D. Steele	Lodi
Lincoln County Agricultural Society	John McQuillan	Merrill
Marathon County Agricultural Society	Robert Pilsch	Ziegler
Marquette County Agricultural Society	Hugh Hamilton	Westfield
Monroe County Agricultural Society	John L. Jones	Leon
Outagamie County Agricultural Society	John Dey	Hortonville
Ozaukee County Agricultural Society	A. R. Boerner	Cedarburg
Pepin County Agricultural Society	P. J. Ryan	Durand
Pierce County Agricultural Society	W. H. Fleming	Ellsworth
Portage County Agricultural Society	Jerome Nelson	Nelsonville
Polk County Agricultural Society	W. M. Bianding	St Croix Falls
Price County Agricultural Society	F. W. Sackett	Phillips
Richland County Agricultural Society	F. W. Burnham	Richland Center
Rock County Agricultural Society	J. E. Gleason	La Prairie
Sauk County Agricultural Society	John M. True	Baraboo
Seymour Fair and Driving Park Association	James Dean	Seymour
Shawano County Agricultural Society	L. Rollman	Shawano
Sheboygan County Agricultural Society	T. M. Blackstock.	Sheboygan
Sheboygan Exposition and Driving Park Co	T. M. Blackstock.	Sheboygan.
Southwestern Wisconsin Industrial Association	Geo. G. Cox	Mineral Point
St. Croix County Agricultural Society	Cad Holden	Hudson
Taylor County Agricultural Society	H. J. Thompson.	Little Black
Trempeleau County Agricultural Society	Alex A. Arnold	Galesville
Trempeleau County Agr'l, Indus. and Driv. P'k Ass	T. A. George	Hale
Vernon County Agricultural Society	H. B. Saxton	Esofea
Walworth County Agricultural Society	E. Davidson.	Lake Geneva
Washington County Agricultural Society	S. F. Mayer	West Bend
Waukesha County Agricultural Society	E. W. Chafin	Waukesha
Waupaca County Agricultural Society	W. W. Crane	Weyauwega
Waushara County Agricultural Society	J. S. Bugh	Wautoma
Wisconsin Industrial Agricultural Society	H. C. Williams	Ives Grove
Wood County Agricultural and Mechanical Assn	G. L. Williams	Grand Rapids

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AGRICULTURAL SOCIETIES.

Name of Secretary.	Postoffice.	Name of Treasurer.	Post Office.
S. S. Landt	Friendship	G. W. Waterman	Friendship.
J. I. Dewey	Arcadia	A. Hansel	Arcadia.
J. E. Cartwright	Chetek	W. A. Kent	Barron.
D. W. Flatley	Green Bay	H B. Baker	Green Bay.
John Smith	De Pere	J. S. Case	De Pere.
Alex Lees	Gilmantown	J. N. Dillon	Mondovi.
A. A. Anderson	Grantsburg	Simon Thorson	Grantsburg.
D. F. Brown	Bloomington	Herman C. Eucke	Bloomington.
Jud P. Walker	Boscobel	H. B. Edwards	Boscobel.
L. D. Dorschel	Chilton	Wm. S. Lloyd	Brant.
S. M. Marsh	Neilisville	Alonzo Brooks	Lynn.
Kennedy Scott	Rio	J. M. Bushnell	Wyocena.
W. S. Mills	Seneca	H. E. Cron	Seneca.
H. S. Comstock	Cumberland	S. W. Hines	Cumberland.
R. C. Vernon	Madison	Samuel Brown	Madison.
C. W. Harvey	Beaver Dam	H. B. Drake	Beaver Dam.
W. A. Lawrence	Sturgeon Bay	C. L. Nelson	Sturgeon Bay.
O. W. Massee	Louisville	J. B. Chickering	Menomonie.
M. L. Hineman	Tomah	W. H. Jackson	Tomah.
T. A. Burr	Lancaster	W. J. McCoy	Lancaster.
Robt. A. Etter	Monroe	A. Lewis	Monroe.
R. A. Markham	Manitowoc	O. A. Alter	Manitowoc.
J. W. Reese	Dodgeville	J. H. Ford	Dodgeville.
H. J. Ormsby	Black River Falls	James Livingstone	Black River Falls.
F. P. Kispert	Jefferson	O. F. Roessler	Jefferson.
J. C. Baldwin	Mauston	F. A. Adler	Mauston.
Adolph Ebel	Kewaunee	John Sten, Jr	Kewaunee.
S. W. Brown	West Salem	F. H. A. Nye	West Salem.
W. E. Lockerby	La Crosse	F. G. Tiffany	La Crosse.
Fred Hayssen	Antigo	C. S. Leykom	Antigo.
James S. Bishop	West Superior	F. A. Woodward	West Superior.
Geo. F. West	Darlington	James H. Keefe	Darlington.
Chas. Pearson	Ironton	H. Thornton	La Valle.
E. F. Vanderpoel	Lodi	J. B. Dwinell	Lodi.
C. C. Townsend	Merrill	John Hinz	Merrill.
E. B. Thayer	Wausau	John Kiefer	Wausau.
L. W. Hettinger	Westfield	Frank Gibson	Westfield.
L. C. Morse	Sparta	John Gilliland	Leon.
H. D. Harducker	Hortonville	Martin McComb	Hortonville.
D. E. McGinley	Cedarburg	L. E. Shroeder	Salter.
W. H. Huntington	Durand	J. J. Morgan	Durand.
L J. Moody	Ellsworth	J. B. Maynard	Ellsworth.
John Harkness	Amherst	P. N. Peterson	Amherst.
L. B. Dresser	St. Croix Falls	John Connors	St. Croix Falls.
E. W. Murray	Phillips	Allan Jackson	Phillips.
J. G. Bunell	Richland Center	T. M. Hart	Richland Center.
E. B. Heimstreet	Janesville	S. L. James	Janesville.
J. S. Hall	North Freedom	H. Marriott	Baraboo.
L. H. Tubbs	Seymour	F. H. Dean	Seymour.
W. W. Holister	Shawano	F. O Perry	Shawano.
Henry W. Kalk	Sheboygan Falls	A. O. Heald	Sheboygan Falls.
J. A. Crozier	Sheboygan	John Balzer, Jr	Sheboygan.
H. S. Weil	Mineral Point	Phil Allen, Jr	Mineral Point.
Max Gouldburg	Hudson	L. Crandall	Hudson.
T. M. Miller	Medford	T. M. Miller	Medford.
F. G. Davis	Galesville	J. A. Kellman	Galesville.
H. H. Scott	Whitehall	D. Wood	Whitehall.
C. J. Smith	Viroqua	W. W. Powell	Viroqua.
Samuel Mitchell	Elkhorn	L. G. Latham	Elkhorn.
Joseph Ott	West Bend	Geo. W. Jones	West Bend.
W. H. Smith	Waukesha	F. R. Fuller	Waukesha.
David Wafler	Weyauwega	John Boongesser	Weyauwega.
J. F. Ellarson	Wautoma	George P. Walker	Wautoma.
A. B. Hayes	Union Grove	C. M. Deitrich	Racine.
E. B. Brundage	Grand Rapids	F. J. Wood	Grand Rapids.

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LAWS RELATING TO THE SOCIETY.

The Wisconsin State Agricultural Society was organized March 8, 1851, and incorporated by

CHAPTER 5, LAWS OF 1853.

SECTION 1. The Wisconsin State Agricultural Society is hereby declared a body politic and corporate, and by that name it shall be known in all courts and places whatsoever.

SECTION 2. The objects of the society being to promote and improve the condition of agriculture, horticulture and the mechanical, manufacturing and household arts, it shall be allowed for these purposes only, to take, hold and convey real and personal estate; the former not exceeding ten thousand dollars.

SECTION 3. The said corporation shall possess all the powers and privileges conferred, and be subject to all the liabilities imposed upon corporations by the revised statutes of this state, so far as the same may be applicable.

SECTION 4. For the purpose of organizing said society under this charter and for the transaction of such other business as may come before it, the executive committee of the society may call a meeting of the same at such time and place as they may deem proper; first giving due notice thereof.

CHAPTER 40, LAWS OF 1854.

SECTION 2. It shall be the duty of the executive committee of said Wisconsin State Agricultural Society, to keep an accurate account of the manner of expenditure of said sum of money hereby appropriated, and transmit the same, together with the vouchers therefor, to the governor of the state, in the month of January in each year, to be by him laid before the legislature.

SECTION 3. It shall be the duty of said executive committee of the Wisconsin State Agricultural Society to collect, arrange and collate all information in their power, in relation to the nature, origin and preparation of soils; the cultivation and growth of crops; the breeding and management of stock; the application and character of manures and fertilizers; the introduction of new cereals and other grains; and other agricultural sub-

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jects, and report the same, together with a statement of their own proceedings, to the governor of this state, in the month of January, in each year, to be by him laid before the legislature.

CHAPTER 53, LAWS 1858.

SECTION 3. The principal officers of the Wisconsin State Agricultural Society shall have full jurisdiction and control of the grounds on which the society may exhibit, and of all the streets and alleys and other grounds adjacent to the same, during all such exhibitions, so far as may be necessary to preserve and keep good order, and so far as may be necessary to exclude therefrom all other exhibitions, booths, stands or other temporary places for the retail or sale of any kind of spirituous or fermented liquors or other article or articles that they might deem objectionable or offensive to said exhibition. The president of the society or in his absence, any vice-president acting in his stead, shall have the power to appoint any necessary policemen to assist in preserving the peace, quelling any disturbance or arresting offenders and conveying them to jail for trial, and all such policemen thus appointed shall be vested during the continuance of such exhibition with the ordinary powers and authority of common constables, and be entitled to similar fees for any services rendered or duty performed. Any person or persons who shall wilfully and without leave enter any fair grounds during an exhibition, that are duly enclosed with a proper fence, not less than six feet high, either by climbing over, or under, or through said fence, or by fraudulently receiving and using the tickets or badge of another, or passing the gate-keeper without the proper payment and compliance with the rules of said grounds, shall be deemed guilty of a misdemeanor, and upon conviction thereof before any court, shall be liable to a fine of not less than five nor more than twenty-five dollars; and in case of non-payment, to imprisonment in the county jail not less than one nor more than ten days. Any such offender may be tried before any justice of the peace, or police justice most convenient to be found.

JOINT RESOLUTION NO. 7, SESSION LAWS OF 1866.

Resolved by the assembly, the senate concurring, That the rooms on the north side of the west wing of the capitol, to-wit: The rooms just made vacant by the removal of the attorney general and the superintendent of public instruction, be prepared by the superintendent of public property, for the use of the Wisconsin State Agricultural Society, and that the said society be and hereby is allowed the use of the same until otherwise ordered by the legislature.

CHAPTER 95, LAWS OF 1870.

SECTION 1. Joint stock associations formed under the laws of this state for the encouragement of industry by agricultural and industrial fairs and

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exhibitions, may purchase and hold such real and personal property as shall be necessary for fair grounds, and such property while used exclusive for such fairs and exhibitions, shall be free from taxes. Provided, that the quantity of land so exempt shall not exceed forty acres.

CHAPTER 159, LAWS OF 1875.

SECTION 2. The superintendent of public property is hereby authorized to furnish the office of the Wisconsin State Agricultural Society with stationery upon the order of the secretary of said society, the same as other officers in the capitol are supplied.

CHAPTER 65, LAWS OF 1877.

SECTION 1 provides: That nothing in this act shall be construed to prevent any citizen of any other state from becoming a member or officer of any agricultural society or industrial association which is now organized or may hereafter be organized under or by virtue of any law of this state.

CHAPTER 215, LAWS OF 1877.

AN ACT to donate the cereals and other centennial exhibits made by the state, to the State Agricultural Society.

SECTION 1. The cereals and other seeds and glass globes in which said cereals and seeds were exhibited by the state at the centennial exposition; one agricultural map of the state; one case samples fine wool; one picture of the state capitol, and three pictures of centennial buildings, are hereby donated to the above named society, to be by them kept in the agricultural rooms in the capitol.

CHAPTER 199, LAWS OF 1880.

SECTION 1. The secretary of the State Agricultural Society is hereby authorized to procure for the use of his office the necessary amount of postage stamps or stamped envelopes for the payment of the postage of the official correspondence of his department. The account therefor shall be audited by the secretary of state upon the presentation thereof in the manner hereinbefore provided, and paid out of the state treasury.

CHAPTER 194, LAWS OF 1885.

SECTION 1. There is hereby annually appropriated to the Wisconsin State Agricultural Society the sum of four thousand dollars. *Provided*, that no warrant shall be drawn by the secretary of state for the payment of the sum of money hereby appropriated, except upon the presentation of a sworn statement, signed by the president and secretary of the said Wisconsin State Agricultural Society, certifying that the sale of intoxicat-

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ing liquors has been prohibited and prevented upon the fair grounds of said society during the year for which the appropriation is made.

SECTION 2. It shall be the duty of the several agricultural societies entitled to the state aid of one hundred dollars in this state, to send their president or other representative to the state fair, where the annual election of officers is held, there to act on committee of award, and to cast the vote for the county in the aforesaid election.

SECTION 3. On arrival of the president or other representaive at the state fair he shall report to the secretary thereof, and on the certificate of the secretary of his attendance and performance of the duties named in section 2 of this act, the treasurer shall pay to him two dollars per day for the time he has been in attendance, not exceeding five days, and six cents per mile, one way, over the nearest traveled route from his home to the place where the state fair is held.

SECTION 4. This act shall take effect and be in force from and after its passage.

CHAPTER 423, LAWS OF 1889.

AN ACT to appropriate to the Wisconsin State Agricultural Society ten per cent of its paid premiums.

SECTION 1. There is hereby annually appropriated to the Wisconsin State Agricultural Society ten per centum of its paid premiums.

SECTION 2. On the presentation of the sworn statement of the secretary of said society, setting forth the amount due each year under this act, the secretary of state shall issue his warrant for the same which shall be paid by the state treasurer out of any money in the state treasury not otherwise appropriated.

CHAPTER 526, LAWS OF 1893.

AN ACT to provide for and regulate the printing, binding and distribution of the reports of state officers, departments, institutions and societies.

SECTION 5. And further, there shall be printed annually upon the approval and order of the commissioner of public printing, ten thousand copies of the transactions of the Wisconsin State Agricultural Society, the same to embrace the reports of the county and other agricultural societies, and such matter pertaining to the agricultural industries of the state as shall be deemed important; provided, the whole number of printed pages shall not exceed four hundred. Seven thousand copies of the transactions of the Wisconsin State Horticultural Society; the same to embrace such abstracts of reports of county and other horticultural societies, and such matters pertaining to the horticultural interests of the state as shall be deemed important, provided that the whole number of printed pages shall not exceed two hundred. Eight thousand copies of the transactions of the State Dairyman's Association, the same to embrace such other matters pertaining to the dairy interests of the state as shall be deemed essential;

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provided, that the whole number of printed pages shall not exceed two hundred. Twelve thousand copies of the report of the Agricultural Experiment station of the state university; provided, that the whole number of printed pages shall not exceed two hundred and fifty. Two thousand copies of each of said reports to be bound separately in cloth, all others singly in paper.

SECTION 6. The reports provided for in the preceding section shall be distributed as follows, through the superintendent of public property: Fifteen copies to each member of the legislature, fifty copies to the State Historical Society, ten copies to each county agricultural society and district industrial association, which embraces two or more counties and furnishes the State Agricultural Society a report of its proceedings, to each of the four societies named in the preceding section, fifty copies of the reports of the other three societies, twenty five copies of each of the reports to the library of the state university, to the governor, lieutenant governor, secretary of state, state treasurer, attorney general, state superintendent of public instruction, railroad commissioner and insurance commissioner twenty-five copies each; to the state superintendent of agricultural institutes fifty copies; to the superintendent of public property, commissioner of labor statistics, adjutant general, quartermaster general, state board of health, each ten copies; to each public library in the state two copies; to each state normal school two copies; to each of the state charitable and penal institutions, one copy, and the remaining copies to the respective societies for distribution by their secretaries.

SECTION 7. In no case shall the number of printed pages in any report provided for in the act exceed the maximum number specified, except upon written request of the officer submitting the same, and then only upon previous written approval of a majority of the commissioners of public printing, such application and approval to be filed with the secretary of state.

CHAPTER 381, LAWS OF 1891.

AN ACT to authorize the commissioners of public lands of the state of Wisconsin to loan a portion of the trust funds of the state of Wisconsin to the Wisconsin Agricultural Society for the purchase of lands near the city of Milwaukee, and the erection of suitable buildings thereon.

The people of the state of Wisconsin, represented in senate and assembly, do enact as follows:

SECTION 1. The commissioners of public lands, with the approval of the governor of the state of Wisconsin, are hereby authorized, in their discretion to loan of the trust funds of the state a sum not exceeding one hundred and fifty thousand dollars to the Wisconsin State Agricultural society, to be used by such society for the purchase of not less than one

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hundred acres of land situated within ten miles of the county court house in the city of Milwaukee; provided, the lands so to be purchased shall first be approved by the said commissioners as to quality and price; and provided further, that the amount so loaned by such commissioners shall not exceed two-thirds of the purchase price of the lands to be purchased by said society. And the said Wisconsin State Agricultural Society is hereby authorized to borrow such amount of said commissioners and to issue to the state of Wisconsin, by the proper officers thereof, bonds therefor. Such indebtedness shall bear interest at the rate of four per cent. per annum, payable annually, and the principal so loaned shall be paid twenty years from the date of such bonds, and such bonds shall mature and be fully paid within twenty years of the date of their issue.

SECTION 2. Said bonds shall be secured by a first mortgage upon the real estate so purchased, which shall be free and clear from any and all lien or incumbrances prior to said mortgage. Such bonds and mortgage shall be in form to most fully protect the state in every contingency and shall before acceptance, be approved as to form and execution by said commissioners. And said mortgage shall contain proper provision for the keeping of the buildings of said society upon such lands, insured for the benefit and protection of the state at all times during the pendency of such mortgage.

SECTION 3. This act shall take effect and be in force from and after its passage and publication.

Approved April 22, 1891.

CHAPTER 184, LAWS OF 1893.

AN ACT to authorize the commissioners of public lands of the state of Wisconsin to loan a portion of the general funds of the state of Wisconsin to the Wisconsin State Agricultural society, for the purposes therein named.

The people of the state of Wisconsin, represented in senate and assembly, do enact as follows:

SECTION 1. The commissioners of public lands, with the approval of the governor of the state, are hereby authorized and directed to loan of the general fund of the state the sum of thirty thousand dollars to the Wisconsin State Agricultural Society, to be used by such society for the payment of its present insecured indebtedness, and the balance, if any, to be expended in improving said grounds, and the said Wisconsin State Agricultural Society is hereby authorized to borrow such amount of said commissioners, and to issue to the state of Wisconsin, by the proper officers thereof bonds therefor, and to execute such mortgages and conveyances as the commissioners shall deem necessary. Such indebtedness shall bear interest at the rate four per cent. per annum, and the principal so loaned shall be paid ten years from the date of such bonds, and such bonds shall mature and be fully paid ten years from the date of their issue.

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SECTION 2. Said bonds shall be secured by mortgage upon the real estate of Said Wisconsin State Agricultural Society, which shall be free and clear from any and all liens or incumbrances prior to such mortgage except a mortgage now held by the state of Wisconsin and a mortgage held by E. C. McFetridge covering said property. Such bonds and mortgages shall be in form to most fully protect the state in every contingency and shall before acceptance be approved as to form and execution by such commissioners, and such mortgage shall contain proper provisions for the keeping of the buildings of said society upon such lands insured for the benefit and protection of the state at all times during the pendency of this mortgage.

SECTION 3. Before any money is appropriated by this act shall be drawn from the state treasury as herein provided, the president, secretary and treasurer of said Wisconsin State Agricultural Society shall make and execute to the state of Wisconsin a bond in the penal sum of thirty thousand dollars with two or more good and sufficient sureties, who shall severally justify their liability under oath, such sureties and bond to be approved by the governor, and such bond shall be conditioned upon the faithful and honest application of all moneys appropriated by this act and received by such president, secretary and treasurer, or either of them, for the uses and purposes in this act specified, and a contract and verified statement of the indebtedness of said society otherwise than its indebtedness secured by mortgage, and such bond, when so made, executed and approved, shall be placed on file in the office of the secretary of state.

SECTION 4. This act shall take effect and be in force from and after its passage and publication.

Approved April 15, 1893.

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CONSTITUTION.

ARTICLE I.

OF THE NAME AND OBJECT OF THE SOCIETY.

This society shall be known as the "Wisconsin State Agricultural Society." Its object shall be to promote the advancement of agriculture, horticulture, and the mechanical and household arts.

ARTICLE II.

OF THE MEMBERS.

The society shall consist of life members, who shall pay on subscribing, twenty dollars, and of honorary and corresponding members, who shall be elected by a two-thirds vote of all the members of the executive board at any regular meeting. The presidents of county agricultural societies shall be members *ex officio*, entitled to the same privileges as life members, and together shall be known as the general committee of the society.

ARTICLE III.

OF THE OFFICERS.

The officers of the Society shall consist of a president, one vice president for each congressional district of the state, a secretary, a treasurer, and seven additional members, who shall hold their respective offices for a term of one year from the first day of January next succeeding the date of their election, and until their successors shall have been elected, and all of whom, together with the ex-president latest in office, and the president and general secretary of the Wisconsin Academy of Sciences, Arts and Letters, shall constitute the Executive Board.

ARTICLE IV.

OF THE POWERS AND DUTIES OF OFFICERS.

The presidents and vice-presidents shall perform such duties as are common to such officers in like associations, as may be required by the Executive Board.

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The secretary shall keep the minutes of all meetings, and have immediate charge of the books, papers, library and collections, and other property of the society. He shall also attend to its correspondence, and prepare and superintend the publication of the annual report of the Society, required by law.

The treasurer shall keep the funds of the Society and disburse the same on the order of the president, or vice president, countersigned by the secretary, and shall make report of all receipts of all expenditures at the regular meeting of the Society in December.

The executive board shall have power to make suitable by laws to govern the action of the several members thereof. They shall have general charge of all of the property and interests of the Society, and make such arrangements for the holding and management of general and special exhibitions as the welfare of the Society and the interests of industry shall seem to require.

The general committee shall be charged with the interests of the Society in the several counties where they respectively reside, and constitute a medium of communication between the executive board and the public at large.

ARTICLE V.

OF MEETINGS AND ELECTIONS.

The annual meeting of the Society for the transaction of general business, shall be held in its rooms at Madison, on the first Wednesday in December, at nine o'clock A. M., in each year, and ten days' notice thereof shall be given by the secretary in one or more papers printed in the city of Madison.

The election of officers of the Society shall be held each year during and at the general exhibition, and the exact time and place of the election shall be specified by the secretary in the official list of premiums, and in all the general programmes of the exhibition.

Special meetings of the Society will be called by order of the executive board. on giving twenty day's notice in at least three newspapers of general circulation in the state, of the time, place and object of such meetings.

At any and all meetings of the Society. ten members shall constitute a quorum for the transaction of business, though a less number may adjourn from time to time.

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ARTICLE VI.

OF AMENDMENTS.

This constitution may be amended by a vote of two-thirds of the members attending any annual meeting; all amendments having been first submitted in writing at the previous annnal meeting, recorded in the minutes of the proceedings, and read by the secretary in the next succeeding meeting for the election of officers. All amendments proposed shall be subject to amendment by a majority vote at the menting when presented, but not thereafter.

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BY-LAWS.

SECTION I.

OF OFFICERS.

The officers of the Society shall, *ex-officio*, fill the corresponding offices in the Executive committee.

SECTION II.

OF THE DUTIES AND POWERS OF OFFICERS.

The duties of the President, in addition to those defined by the constitution and the by-laws regulating the duties of the permanent committee shall be as follows, to-wit:

1. To inspect the fair grounds after they shall have been prepared for the annual exhibition by the special committee of arrangements, appointed for that purpose, and suggest such modifications or further preparations as he may deem necessary.

2. To formally open the annual fair of the society at such time as the Executive committee may prescribe, with an appropriate address.

3. As the executive head of the Society, to have a general supervision and control of the entire exhibition, subject only to the authority of the Executive committee.

The duties of the Secretary, more especially defined than in the constitution, shall be as follows:

1. To make a faithful record of each meeting of the Executive committee and keep such record in a condition for the convenient reference of any member thereof, at any time, also to make a record of every order drawn on the treasurer, and delivered to parties in whose favor they were so drawn—separately entering and numbering the orders drawn to pay premiums and those to pay general expenses, and so defining them—and of all moneys due the Society; in all cases holding the parties so indebted, responsible therefor, until they shall have presented him a certificate from the treasurer showing that the same has been paid.

2. To open and carry on such correspondence as may be advantageous to the Society or to the common cause of agricultural improvement, not

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only with individual agriculturists and eminent practical and scientific men of other industrial pursuits, but also with other societies or associations whose objects are kindred to ours, whether in this country or foreign lands, and to preserve a journal of such correspondence in the archives of the Society.

3. To collect and arrange for convenient examinations, standard agricultural works and periodical publications, together with such models, machines and implements as may be donated to, or otherwise acquired by the Society.

4. To investigate as far as practicable, the nature of fertilizers, indigenous and cultivated plants, insects injurious to vegetation, etc., and to collect and preserve such specimens thereof, as will illustrate the natural history and agricultural resources, condition and progress of the state.

5. To institute and collect reports therefrom, needed experiments relative to the preparation of the various soils of the state for economical culture, the cultivation of different grains, fruits and garden vegetables, the the breeding and raising of stock, etc.

6. To visit, by the advice of the executive committee, or as his own judgment may direct, the various portions of the state. and to give lectures on the science and practice of agriculture, wherever and whenever they may be deemed most necessary and desirable.

7. To co-operate with the superintendent of public instruction and the agent of the normal school board, for the introduction and use in the schools of Wisconsin, of standard works on agriculture and other industrial arts and sciences.

8. To attend as many as possible of the industrial exhibitions of this country, particularly the county fairs of Wisconsin; to co-operate with the president and special committee of arrangements for the judicious preparation and management of our state exhibition; and to have the sole supervision and control of the offices of entry thereat.

9. To carefully prepare and superintend the publication of the annual report of the society to the governor of the state, embodying therein the proceedings of the State Agricultural Society, an abstract of the reports of the incorporated county agricultural societies of the state, and such reports, essays and addresses, or other matters of information, as may be may be calculated to enhance the value of said report.

Finally, it shall be his duty, not only by the means above named, but also through such other instrumentalities as he may devise, and the committee approve, to devote himself faithfully and unreservedly to the promotion of the industrial interests of the state.

It shall be the duty of the Treasurer—

1. To receive primarily and exclusively all moneys due the society, from whatever source.

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2. To keep a full and faithful record of all receipts of moneys coming into his hands, and of the sources whence derived, in a book specially furnished by and belonging to the Society, and to have the same open at all reasonable times, to the inspection of any person or persons authorized by the executive committee to make such examination.

3. To likewise keep an exact record of every order by him paid, and such record must be verified by the proper vouchers showing that the sums therein named have been by him so paid.

SECTION III.

OF MEETINGS.

The Executive Committee shall meet annually, on the day preceding the day on which the annual meeting of the Society is held, on Monday preceding the first Tuesday of February, and again on the first day of the annual fair.

They shall also meet at the call of the secretary — the president and a vice-president of the society concurring — and may adjourn to any stated time.

SECTION IV.

OF A QUORUM.

At any meeting of the executive committee, four members thereof shall constitute a quorum for the transaction of business.

SECTION V.

OF PERMANENT COMMITTEES.

There shall be two permanent committees of the Executive committee which shall be respectively styled the *Standing Committee* and the *Finance Committee.*

The Standing Committee shall consist of the president, the secretary and the treasurer, who shall have the power in the recess of the executive committee to draw orders on the treasurer for all necessary current incidental expenses. But the Executive committee shall have authority, and are hereby required to revise the proceedings or transactions of said Standing committee, and endorse or disapprove the same.

The Finance Committee shall consist of the president and treasurer, and it shall be their duty to suggest means for increasing the revenues of the Society.

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They shall also have authority to invest any portion of the funds of the Society that may from time to time be set apart by the Executive committee for investment, disposing of such funds upon such terms and conditions as may be prescribed by the said Executive committee.

Each of the above-named sub-committees shall be responsible for the faithful discharge of their duties to the Executive committee, to whom an appeal may at any time be taken from their acts or decisions.

The auditing, adjusting, allowing or rejecting of all bills, claims or demands, of whatsoever nature, against the society, and the issuing of orders upon the treasurer for payment of the same — except for the current incidental expenses of the Society, as by this section already provided for— shall devolve upon the Executive committee; and it shall be the duty of said committee to annually examine the books, papers and vouchers of the treasurer and secretary, and compare the same, and adjust the accounts between those officers and the Society, and report thereon at the annual meeting in December.

SECTION VI.

OF THE ORDER OF BUSINESS.

The following order of business shall be observed at all meetings of the Executive committee.

1. Reading of the minutes of the preceding meeting.
2. Reading of the minutes and reports of the Standing committee.
3. Reading of the minutes and reports of the Finance committee.
4. Report of Auditing committee.
5. Reports from special committee.
6. Communications from the secretary.
7. Communications from members of the committee.
8. Unfinished business.
9. Miscellaneous business.

The order of business may be suspended, however, at any time by a vote of the majority of the members present.

SECTION VII.

OF THE FISCAL YEAR.

The fiscal year of this Society shall commence on the first Wednesday of December in each year, and all annual reports of the year previous shall be made up to that time.

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SECTION VIII.

OF THE EXPIRATION OF TERMS OF OFFICE.

The terms of office of all the officers of this society shall expire on the 31st day of December of each year.

SECTION IX.

OF AMENDMENTS.

These by-laws may be amended at any regular meeting of the Executive committee by a vote of eight of the members thereof.

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MINUTES OF MEETING OF EXECUTIVE BOARD.

ANNUAL MEETING.

AGRICULTURAL ROOMS, MADISON, WIS., December 5th, 1893.

In the absence of President Parkinson, Vice-President Fratt was elected president pro tem.

Roll called, present: Fratt, Newton, Jones, Harding, Arnold, Clark, Adams, Wylie, Blackstock, Hubbard, Youmans and True.

The offer of the State Board of World's Fair Commissioner's to donate to the Society the agricultural pavilion and certain cases used in the state exhibit at Chicago, was presented by the secretary, and the offer was accepted by the board, and the secretary was instructed to arrange for the taking down and transporting such property to the fair grounds in Milwaukee.

On motion of Mr. Harding, the rules adopted at the last meeting of the board, relating to revision of premium list and appointment of judges was adopted, to govern the action of the society for the coming year.

On motion of Mr. Arnold, proceeded to ballot for superintendents of departments for the fair of 1894, when the following named persons were selected:

Superintendent of Speed	H. D. McKinney	Janesville.
Superintendent of Horses	C. A. Youmans	Neillsville.
Superintendent of Cattle	A. A. Arnold	Galesville.
Superintendent of Sheep	C. M. Clark	Whitewater.
Superintendent of Swine	Geo. Wylie	Leeds.
Superintendent of Poultry	C. G. Wilcox	De Pere.
Superintendent of Agriculture	Geo. Martin	Hudson.
Superintendent of Dairy	W. A. Jones	Mineral Point.
Superintendent of Horticulture	Geo. Harding	Waukesha.
Superintendent of Machinery	T. L. Newton	Beaver Dam.
Superintendent of Manufactures	T. M. Blackstock	Sheboygan.
Superintendent of Fine Arts	H. C. Adams	Madison.
Superintendent of Woman's Work	Kate F. Peffer	Pewaukee.
Superintendent of Forage	C. T. Fisher	Wauwatosa.
Superintendent of Gates	C. M. Cottrill	Milwaukee.
Superintendent of Transportation	J. G. Boyd	Milwaukee.
Marshal		

Dates for fair of 1894, were fixed for September 17th to 22d.

The resignation of President A. C. Parkinson was received and accepted.

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Proceed to ballot for president to fill vacancy, when S. D. Hubbard was duly elected president for the year commencing January 1, 1894.

Secretary was instructed to draft a resolution endorsing the appointment of Mr. W. I. Buchanan as minister to the Argentine Confederation.

Messrs. Arnold, Harding and Jones were appointed a committee to examine treasurer's report in connection with the financial statement of the secretary.

Adjourned until Wednesday morning, at 8:45 o'clock.

JOHN M. TRUE,
Secretary.

WEDNESDAY MORNING, December 6, 1893.

Board met agreeably to adjourment. Mr. Fratt presiding.

Communication from assignee of Marine and Fire Insurance Co., Bank, requesting extension of time for payment of deposits, was received and the board voted to allow such extension on its deposits.

Board adjourned.

JOHN M. TRUE.
Secretary.

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MINUTES OF MEETING OF THE SOCIETY.

MADISON, December 6th, 1893.

Meeting of the Society organized by the election of Mr. Fratt, President pro-tem, President Parkinson being absent. A quorum present.

Messrs. Arnold, Harding and Jones, committee appointed to examine treasurer's report and financial statement of secretary, submitted the fol-following report:

"Your committee to whom was referred the reports of the secretary and treasurer of the society, for the current year, respectfully report that they have compared the two reports, and that they agree.

We find that a balance of $2,851.62, of which $2,592.50 is on deposit in the Marine Bank, is shown by the treasurer's report."

Respectfully submitted;

A. A. ARNOLD,
GEO. HARDING,
W. A. JONES,
Committee.

The report was accepted. Ajourned.

JOHN M. TRUE,
Secretary.

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REPORT OF TREASURER.

To the officers and members of the Wisconsin State Agricultural Society:

I have the honor to hand you herewith, statement of the financial transactions of your society for the year ending December 6th, 1893.

Respectfully submitted,

CYRUS MINER,

Treasurer.

Agricultural Rooms, Madison, Dec. 6, 1893.

RECEIPTS.

Amount of balance from 1892	$3,812 98	
Amount from sale of horses	500 00	
Amount from membership	20 00	
Amount of loan from state	30,000 00	
Amount from sale of tools	755 74	
Amount from rent of State Fair Park	1,000 00	
Amount from Soldiers Heights Land Co	700 00	
Amount from balance of Milwaukee subscription	70 50	
Total receipts		$36,859 22

DISBURSEMENTS.

Paid secretary, warrants 1 to 98	$33,408 92	
Paid warrants of 1891 and 1892	598 68	
Total disbursements		$34,007 60
Balance		2,851 62
Deposited in Wis. Marine & Fire Ins. Co. Bank		2,592 50
Balance on hand		259 12

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SECRETARY'S WARRANT ACCOUNT, 1893.

No.	To whom and for what issued.	Amount.
1	Cyrus Miner, salary, 1892	$100 00
2	Cyrus Miner, expenses, 1892	131 44
3	Miss Lou. Hart, trea's clerk	10 00
4	Newton & Wenz, express	50
5	Cyrus Miner, services on site and imp. com	170 00
6	A. C. Parkinson, services on fair ground, 1892	469 32
7	A. C. Parkinson, services on fair ground, 1892	30 68
8	John Pfeifer, work and repairs, 1892	30 65
9	W. U. Tel. Co., messages, Nov	60
10	James G. Boyd, services on fair grounds, 1892	500 00
11	A. J. Philips, Asst. Hort. Dept., fair, 1892	14 00
12	C. E. Clough, board of workmen, Nov., 1892	15 00
13	C. E. Clough, wages, Nov., 1892	50 00
14	Leonard Leiser, work, Nov., 1892	18 00
15	Thos. Machkorach, work, Nov., 1892	27 50
16	John M. True, miscellaneous expenses	10 25
17	John M. True, salary, Dec., 1892	150 00
18	Miss F. L. Fuller, salary, assistant	83 33
19	Nicholas Smith, printing	6 50
20	R. D. Evans, attorney's fees	2 00
21	Rudolph Widman, moving buildings	30 00
22	W. U. Tel. Co , messages, Dec	25
23	Mrs. R. E. Jones, premiums, 1892	3 00
24	C. E. Clough, Wages, Dec	50 00
25	John M. True, salary, Jan	150 00
26	State Journal Co., subscription	6 00
27	C. E. Clough, wages, Jan	50 00
28	W. U. Tel. Co., messages Jan	95
29	T. L. Newton, expenses at board meeting	14 68
30	C. T. Fisher, expenses at board meeting	6 00
31	C. E. Clough, expenses at board meeting	4 72
32	John S. Hall, expenses, speaker at convention	6 00
33	A. A. Arnold, expenses at board meeting	14 96
34	Mandolin Club, music at convention	5 00
35	G. H. True, help in office	10 00
36	C. A. Youmans, expenses at board meeting	13 00
37	C. G. Wilcox, expenses at board meeting	$7 50
38	A L. Fisher, expenses speaker at convention	4 50
39	W. N. Johnson, expenses, speaker at convention	10 60
40	S. D. Hubbard, expenses, board meeting	10 00
41	Geo. Martin, expenses, board meeting	21 16
42	Frank S. Horner, printing programs	15 00

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No.	To whom and for what issued.	Amount.
43	W. W. Warner, rent of organ for convention	$1 00
44	Journal Co., advertising	25
45	John M. True, office expenses	10 25
46	John M. True, salary, February	150 00
47	Hotel Van Etta, board, Mr. and Mrs. Eaton	4 00
48	C. E. Clough, wages, February	50 02
49	C. E. Clough, wages of Machorach, December	25 00
50	A. C. Parkinson, expenses in society work	50 00
51	John M. True, salary, March	150 00
52	Rosenkrans & Thatcher, ten gold medals	60 00
53	The Journal Co., subscription	3 75
54	T. M. Blackstock, expenses at board meeting, etc	20 00
55	L. H. Gregg, feed for team	43 26
56	Martin Jewet, blacksmithing	16 80
57	Cyrus Miner, expenses and salary	62 97
58	C. H. Welch, reporting convention	113 65
59	John M. True, salary and expenses	300 00
60	C. E. Clough, wages, Mar	50 00
61	Cyrus Miner, paid Atty. Ruger	15 00
62	Hotel Van Etta, board President Parkinson	6 00
63	W. U. Tel. Co., messengers, February, March and April	13 75
64	Madison Democrat, subscription	2 50
65	John M. True, Bal. salary, April and May	30 75
66	F. S. Horner, printing	2 50
67	J. H. Pickrell, Secy. Am. S. H. Herd Book, vol. 38	3 00
68	Geo. C. Cribb, merchandise	18 00
69	L. H. Gregg, feed	40 27
70	Thomas Skinner, Del. to state fair, 1892	13 50
71	J. R. Fleming, work repairing track	13 75
72	John Gavart, work repairing track	21 00
73	Frank Brower, work repairing track	3 00
74	Currie Brothers, grass seed	$17 99
75	John M. True, salary, June	150 00
76	H. D. M. Kinney, expenses, board meeting	5 25
77	Chas. L. Lull, hay	27 12
78	John Johnston, claims against society	27,301 32
79	John M. True, expenses and help	10 00
80	Void from suspension of bank	.....
81	Void from suspension of bank	.....
82	Void from suspension of bank	.....
83	Void from suspension of bank	.....
84	John M. True, salary, July	150 00
85	M. J. Cantwell, printing	4 50
86	John M. True, salary, August	150 00
87	John M. True, expenses and assistance	8 00
88	John M. True, salary, September	150 00
89	A. C. Parkinson, services and expenses	50 00
90	State Park Co., improvements on grounds	500 00
91	Void	.....
92	C. E. Clough, material and labor in improvements	356 18
93	C. E. Clough, feed, blacksmith's bill, etc	99 56

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No.	*To whom and for what issued.*	*Amount.*
94	John M. True, salary, Oct.	$150 00
95	John M. True, expenses in Chicago at conventions.	14 00
96	B. M. Weil, insurance and collection	557 00
97	John M. True, salary, Nov.	150 00
98	John M. True, expenses, bus. trip to Chicago	7 00
		$29.860 92

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INTERESTING PAPERS

FOR

Farmers and Stockmen.

SOILS AND CROPS.

John Rhodes—Union Grove.

Shall we grow larger and better crops, or let the farm run down until we cannot live on it, then sell out for what we can get and go west or in some other direction to impoverish other soils, are as important questions today as any which farmers need to consider. Notwithstanding the work of our experiment stations and farmers' institutes, a majority of the farms of our state are capable of yielding double the crops they now produce. I am ashamed to say that there are naturally fertile lands in Racine Co., which yielded last summer 20 to 30 bu. of oats per acre and 40 to 50 baskets of corn. These crops required as much labor to plow for, sow, plant, harrow, and harvest as respectable products. (There would be some saving however, in binder twine, threshing bills and hauling off the crop.)

The chief cause of this is, forever taking from the soil and giving little or nothing back. One way is to grow flax and sell both seed and straw. Another is to sell timothy hay, straw and all cereal crops. Another is to feed to domestic animals and then allow the barnyard fertilizers to lie in the yards all summer, leach into wells, wash away into creeks or burn up by fermentation and contaminate the air which we breathe.

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These practices have in some of the older states east of us reduced the price of farm lands to a mere pittance, driven thousands of farmers to abandon their homes, and compelled others to spend thousands of dollars in fertilizers.

Why should we do this here? It is costly and extravagant to deteriorate the soil, but much more costly to bring back its wasted fertility.

Rather than run over large fields in a slip-shod manner would it not be better to sell half, and bestow the same labor on the remainder? It is labor, which costs, and the farmer must do a good deal of hard work to enable him to take things easy. The pond in the plow field which grows nothing but muskrats and malaria must be moved. The drain will do this so effectually as to make the pond the dryest and best land in the field and leave a straight furrow through, where the team before had to make hundreds of turns in a quagmire to avoid it. The whole field is more valuable through drainage of wet spots because it enables the farmer to get in small grain earlier. This often adds much to strength of straw and plumpness of grain. To cultivate soils with pleasure, stone, stumps and trees should be removed. For the largest stone, dynamite is quite a help in throwing out and breaking. It can also be used on stumps. Trees are a great nuisance in destroying and impoverishing the growing crops. I have traced the roots of a large tree 68 feet from its trunk, supposing them to extend the same in all directions, making an impoverished circle over 8 rods in diameter. Acorns are the dearest fruit we have ever raised. The cheapest way for a young and strong man to remove trees is with pick, spade and axe. Men past 50 would likely prefer to cut above ground and hoist the roots with dynamite.

Some of our best farmers draw out their manure in winter, thus checking fermentation, avoiding packing the soil by hauling heavy loads over it when wet, and gaining so much valuable time in the spring. Unless considerable bedding is used plank floors under horses and cattle are very wasteful of fertilizers besides affording safe harbors for rats and mice. My

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impression is that in time cement will take the place of planks for stable floors.

In plowing the soil we very much dislike to see it shine after the plow and prefer to wait until the land is dryer. When tne right time comes the work should be pushed to a finish before the soil turns up in lumps. These lumps are hard to pulverize in the spring but will mellow with the frost in winter after fall plowing.

Next comes cultivation of hoed crops. In clay loams the surface of the soil needs stirring after each rain. As in plowing, the same caution is needed to avoid stirring when too wet, and to finish the work before a thick crust has formed. By keeping a level mellow surface, we can almost cultivate around a drouth. To conclude there is nothing discouraging about maintaining and increasing fertility. Nature will help us in many ways and not least through the family of legumes which include beans, peas and clover.

FERTILITY, HOW TO REGAIN AND RETAIN IT.

George B. McGilvra, Baraboo.

The wording of my subject would indicate that our farming lands are less fertile than they were or should be. I have no statistics at hand to prove the assertion, but according to stories of the early settlers in the country, it was formerly no uncommon thing for yields of 40 to 50 bushels of wheat per acre to be threshed, while now with all our modern implements for tickling the soil, it is rarely that the 35 bushel crop is produced. This would indicate that our soils have become depleted. That being the case what is the remedy? We must make good this waste in some one or more of the following ways. Free application of barnyard manure, plowing under clover, sowing commercial fertilizers, and more thorough tillage. What is manure? The word is derived from two Latin words meaning

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"hand labor" or to work by hand, that is, it meant tillage. Not till Stercutius, an observing Roman "Granger," noticed that the droppings of animals left on the ground had the same effect on surrounding vegetation that continual stirring of the soil had, was any use made of what we now call barn yard manure. The people of his time voted him a god. Short-sighted mortals! they little thought of the aching backs and blistered hands to be carried by generations yet unborn. Those old time farmers were not wholly wrong in their early farm practices, for I think it is a fact noticed by most of us that other things being equal, that part of a field receiving the most tillage will give the best results. Now what is the best course to pursue, to restore our lands to that state of fertility in which our predecessors found them. Without doubt, the frequent application of barn yard manure which has been well taken care of, supplemented by free sowing and feeding of clover will prove to be the best course for the average farmer. I said manure well taken care of, what are we to understand by that?

There are manures and manures, and they may be as unlike as sour whey and separator cream. My idea of good barnyard manure is, the excrement of our animals, mixed with enough of some kind of absorbent to take up and retain all the liquids, and then so handled and applied that little or none of the plant food is lost. That definition is not quite so long as the tariff debate, and I think you can understand it better. Our surroundings are so very different that no iron clad rule can be given by which the above requirements can be met. I will give our manner of handling our stable manure, believing that for us it is the best. Of course our rule is somewhat flexible. All our stock is housed except hogs and they are part of the time. We use straw freely for bedding, our horses and cows are in the same basement. For years until this winter it has been our aim to draw and apply the manure as soon as taken from the stable, generally applied to sod that was to be plowed in spring and planted to corn. This was all right for that year, but when we

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plowed again and sowed to oats we got too rank a growth of straw and not enough grain. We have been experimenting a little for several years, and this season have adopted the following method:

We intend to clean our stables every morning. The manure is all taken to the same pile. After one stable is cleaned the manure is spread, that is it is leveled down, then the other stable is cleaned the manure put on top of the first and that is leveled; we now have it mixed. It soon begins to heat and as we have the cold cow manure well distributed through the pile there is no firing. In a few weeks the mass is good condition to apply to our meadows or pastures. The heating has so decomposed the straw that was used for bedding that it is readily loaded, not bad to unload, and has rendered the plant food sooner available. The grass plant will use more of it the first year after applying, less rubbish will be raked up with the hay, and by the time the crop of corn has been grown I think the oats following will stand better than had we continued our former practice. I think that if I was on a farm somewhat run down, our old way would still be preferable, as it saves once handling, and I would be sure of getting immediate returns. We do not allow our manure to accumulate to any considerable extent except in the sheep sheds where it is covered. Our manure pile receives an occasional sprinkling of land plaster, also the stables. We always spread as fast as drawn. I can spread faster and more evenly from the load than from the ground, and if there is any leaching I want it to be uniform over the field not in spots. I am of the opinion that where applied as we are now doing, to clover, and on fairly level land that there is not enough loss from washing to be perceptible. Even on quite rolling land, rather than be obliged to draw on a wagon over the soft ground cutting and packing the soil, I would draw in winter and stand the washing. I have said that there is manure and manure. One man may apply 40 tons of what he calls manure to an acre, and does not get as good returns as his neighbor who applies 20 tons. The kind of animal fed,

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the feed used and the handling of the excrement cut a great figure in the value of a ton of manure when it is ready to apply to the field. We must revolutionize our mode of building stables. Instead of elevating our stable floors on high timbers and boring holes to afford drainage, we must drop our floors, lay them double with tar between or bed them in cement, or what is perhaps still better, though little tried in this western country, build over stable floors of grout and cement, enabling us to save all the liquid which careful experiment has proven to be the most valuable part of the excrement from our animals. The following table will show the comparative value of a ton of manure where the conditions are the same and all the liquids and solids are carefully saved from the four kinds of animals of which we keep the most:

Horse—		Sheep—	
Solid	$1.36	Solid	$1.59
Liquid	8.62	Liquid	11.31
Total	$ 9.98	Total	$12.90
Cow—		Hog—	
Solid	.86	Solid	1.79
Liquid	3.14	Liquid	3.06
Total	$4.00	Total	$4.85

How often and how much should be applied? I am of the opinion that we do not apply often enough, and overdo the thing when we do apply. I would rather have 15 tons per acre applied once in 5 years, than 25 tons every 7 years. I am satisfied that thousands of dollars worth of fertility are lost every year by the too lavish application of manure to our fields. I do not know that any experiments have been conducted to determine this point, but some of our best writers and most practical farmers have accepted the theory that our soils are not able to store up and retain plant food beyond a certain limit any more than an animal can by eating a double ration

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today hold that food in store, until such time as the system needs it to produce flesh or milk. Do not understand me as saying that we must not use manure freely, but I do recommend moderation. Our rule should be, a little and often, get your soil to that state of fertility where it will readily take clover, and let the clover do the rest. The value of a ton of manure is largely determine by the kind and amount of food given. I will give a short table showing the manurial value per ton of some of our most common stock foods after having passed through the animal system:

Oats	7.70
Linseed cake	19.72
Wheat	7.08
Wheat bran	14.59
Corn meal	6.65
Clover hay	9.64

These values are comparative and will vary somewhat, but for our purpose they are accurate enough. If our English cousins can afford to pay the prices asked for linseed meal and bran, transport it across the water to feed to their animals, I can see no reason why we should not make a large profit by keeping more of it at home. Now all these remarks assume that you are what is termed a stock farmer. There are farms not adapted to the successful handling of stock. What shall the owner of such do, to increase or keep up the fertility of his soil? To such I say, use clover for all there is in it, I not only believe it possible, but in many cases think it would be better, easier, and cheaper to depend almost entirely on clover, as a fertilizer. Our farmers do not seem to realize what a helper they have in it. There is no plant adapted to growth in this climate equal to it. If I wished to run my farm to grain without impoverishing it, I should sow mammoth clover with all grain sown, and if the season seemed to demand it, sow plaster as soon as the clover plant was nicely started. This with us has always insured a good stand of clover, and is the only benefit we have have derived from its use except as an absorbent

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in the stables and on the manure pile. Clip back after harvest to thicken up and cause a stocky growth, allow the hay crop to ripen its seed and plow under stubble for wheat or rye, using the manure made about the stables to top dress the lighter spots on the new seeding, and using the clover straw to mulch the more exposed portions of the fall sown grain. I not only believe this plan to be feasible, but am well satisfied that many of us could adopt it to our great advantage. In these times of dear labor and low prices this plan would do away with the rush attending haying and harvesting at the same time. The work could be done with the usual farm help, summer work could be better attended to, the good wife's cares would be diminished, more time could be given to recreation, our children would not become disgusted with the treadmill life of the farm, but would have time to investigate its mysteries, enjoy its beauties, and in time would rise up and thank us for the many pleasant hours we have allowed them on the old farm.

NOXIOUS WEEDS.

W. H. Cole, Waterloo.

The subject of noxious weeds is one of vital interest to all farmers, although not to all tillers of the soil. For many weeds that are most troublesome to the general farmer are not in the least troublesome to the market-gardener. Thus the Burdock, the Snapdragon, the Sow Thistle or the Canada Thistle cause the gardener but little uneasiness; and he would be willing to have a mixture of these seeds sown thickly over his lands if he could only be shown how to kill out purslane without much labor. That is the weed that causes him the most trouble, while it effects the common farmer but little. It is hard for either the farmer or the gardener to put himself in sympathy with the other. Men have yet to learn that it is not the weed

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that is the hardest to kill out on a small tract that is the most dangerous to a community. The weed that is easily carried from place to place by the wind or by animals is much more dangerous than one whose seed is not easily scattered, and a weed that will thrive on cultivated and uncultivated land, is much harder to get rid of than one that thrives under only one of these conditions. All things considered, the Canada Thistle is the weed above every other that all men ought to unite their efforts against. The danger there is of spreading it over the fields by means of the plow and harrow, the long distances the seed is often carried in the air, its tenacity of life in all soils on which grains and tame grasses thrive, make it a formidable enemy, and in order to avail anything in its extermination it is necessary that there be unity of effort. It is of no use for one man, one township, or one county to fight them alone. The man most to be pitied is the energetic, active man who makes a determined effort to get rid of troublesome and noxious weeds while his neighbor is lethargic and careless regarding them. It is like trying to stop the wind to try to get rid of them under such circumstances. If men could be made to see the economy there would be in unity of action, it seems as if there would be no difficulty in awakening a general interest. There is no doubt but, every ten years, there will be labor enough performed trying to eradicate those weeds that are capable of being killed out, to accomplish it, if such labor could be systematically and intelligently directed. But for want of system and proper direction we are in danger of doing the work over, year after year, each decade increasing the amount of labor necessary to keep these pests in check. While I think wise legislative action helpful in causing the destruction of noxious weeds, still I think it unwise that weed after weed should be added to the list. I would have such list cut down to two or three of the most troublesome and dangerous weeds, and then have it seen to that the law be enforced. After we had the mastery of those on the list, then it would do to add others. Just now there is a good deal being said about the Russian Thistle.

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Some are asking for money from the national treasury to help in its extermination, while others declare it to be as helpful as a crop of clover on the land when plowed under green, and that it makes good hay when properly cured. I have never seen this weed except in its matured condition. I found it quite freely scattered over South Dakota. I examined it closely, and have not the least doubt but it will be a great detriment to our prairie states. If we could get rid of it, it would be worth millions of money to this country, and it will be time enough to get what use we can out of it when it becomes an established fact that we cannot get rid of it. I have heard men in this state declare that Canada Thistles made good sheep pasture. But I have seen a poor flock of sheep in a pasture where the thistles were plenty and the grass scarce; and I thought the condition of the sheep would have been improved had the grass been more plenty and the thistles left out. The men who declare that thistles make as good hay as clover are men that are habitually hanging around street corners while men that usually have good hay are drawing in their clover.

Canada Thistles, Sow Thistles and Snapdragon are weeds with similar characteristics; they spread from the root and the seed, the seed often being carried long distances by the wind. The most practical way to kill them out after they have once got a foothold is to keep them cut off at or below the surface. The Canada Thistle is the weed I have had the most experience with. On pasture land you can soon get the mastery of this by salting your stock on them, and hoeing them all off an inch or two below the surface twice a week. On plow land, the best way is to summer fallow, plowing the land as shallow as possible and turn the soil over nicely. The plow should be sharp, so that it will cut the roots all off. After the ground is plowed, drag it thoroughly with a fine toothed harrow to bring the roots to the surface. As soon as the plants have grown to the surface again, repeat the plowing and dragging and continue to do so during the season, plowing a little deeper each time. In the middle of September sow the piece to winter

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wheat or rye. Early in the following spring sow it thickly with alsike and medium red clover. If plaster helps the growth of clover on the soil in which it is sown, I would sow evenly one hundred pounds to the acre. A heavy growth of clover helps to smother out any young thistles that might make their appearance. I would mow the clover twice for hay the year after the grain is cut. It is almost the universal testimony of men who have tried this way of treating thistles that it has been successful, killing them out the first time. But some have failed; and in these cases of failure I have usually found one of three conditions: either they plowed too deep the first time, cutting the roots off so long that they would not drag out; or, they did not pay attention enough to dragging; or, they allowed the thistles to get too much of a start between the different times of plowing.

The Burdock is a biennial and a slow grower. The best way to get rid of them the first year is to dig them out, root and branch, with a spade. This may be best done when the ground is soft after a rain, and should be repeated two or three times during the season, to be sure they are effectually exterminated.

I think the only way to kill out Cockle-burr when it is thickly seeded in soil on which grain is being raised is to plow the field early in the fall before the seed is formed. One should be sure the tops are all turned under, and should pull up all that cannot be reached with the plow. This should be followed up for a few years to be completely successful. The only practical way I know of to destroy Yellow Dock is to pull it up when the ground is soaked thoroughly after a rain.

I was much surprised that our legislature in 1893 thought best to add Sweet Clover (Melilotus Alba) to the list of noxious weeds. This plant has been on my farm for forty years and I have never known of its being any damage to me. It has never spread; all kinds of stock eat it greedily, and it is one of the best plants for bee pasturage. Perhaps in some soils it is hard to kill out, but in my vicinity it is easily killed by either tilling or pasturing. Although the velvet leaf or stamp weed

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is not in the list of noxious weeds, yet it behooves every farmer and gardener to become acquainted with this weed, as it is one of the worst we have in a cornfield. It comes up late in the season and, on rich soil, grows to an enormous size. If it once gets thoroughly seeded on a farm, it will take a lifetime of constant vigilance to get rid of it; but if taken in time it is easily exterminated. There is a cut of all of these weeds in Farmers' Institute Bulletin No. 5, which will help those not acquainted with them to post themselves; also a very instructive paper in Bulletin No. 4, by Dr. R. J. Wilcox. I wish, in conclusion, I could, with absolute certainty, point out the most effective way to unite the energy of the state in getting rid of these accumulating pests. I think it has been proven that the system of having the path-masters of the different road-districts attend to this matter is the most unsatisfactory. The more we can centralize the responsibility, the more efficient will be the service. One live energetic man that is thoroughly in earnest will do more than one hundred men who care but little, or do not realize the importance of getting rid of these soil-robbers.

TOBACCO CULTURE.

Hon. Adam Apple, North Cape.

In preparing this short paper on tobacco culture I simply desire to give some of our experience without undertaking to instruct. In times like the present, when most all products of the farm are cheap, it becomes necessary for the ordinary or every-day farmer to look around, see what combination of crops can be made to enable him to meet his obligations, and make both ends come together at the end of the year. Many of our farmers have gone into the dairy business, and some are patronizing the factory, both of which require considerable capital, and a great share of our land to raise hay, corn, and oats to

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maintain the cows, and keep up the flow of milk. Now, to me it seems desirable that some other money crop, requiring less capital and land, that can be dovetailed in, and followed along with butter and cheese making, ought to be adopted. And for that purpose I know of nothing better than a patch of tobacco. I venture to say that from two to four acres of land adapted to raising the weed could be found on most farms. It takes but little land to raise the crop, and the capital consists almost wholly of labor and that labor need not materially interfere with the other farm work of raising hay and grain. The seed is sown on beds as soon as the weather and ground will permit in spring, and with proper care and attention the plants will be ready to go into the field by the middle of June. Transplanting is now done with the tobacco planter, an implement that will plant all day, and not complain of a lame back at night. If the ground has been properly handled before planting, it will not require any more labor to cultivate and keep clean than a crop of potatoes. You need to be somewhat more precise. Topping and suckering, while it has to be done properly and at the right time, is not very hard nor disagreeable work, and can be performed by the boys and girls. They may not cry for it, but will cheerfully turn in between school hours and help you, providing you make them partners in the business. If the season is favorable your plants will be ready to harvest by the first part of September, and two good men ought to cut, spear and hang up one half an acre per day. It is then left until winter for stripping and getting ready for market. The seed for three or four acres will cost, say, fifty cents. The outlay for a barn or tobacco shed is somewhat of a drawback to the new beginner, but a three-acre crop well attended, ought to build a house to cure it in, and leave enough money over to pay for the labor of raising. We have raised a crop successfully for eight or nine years. I say successfully, because we averaged as many and more pounds to the acre than Dane or Rock counties, and sold for five years in succession to one man in Janesville at the top of the market. Now, if any one should

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be tempted to try the experiment, I would say in conclusion that it requires clean, rich land, black sandy loam preferred, some judgment, plenty of work at the right time, and great care in handling the plants at all times, to prevent tearing and injuring and so destroying their value.

THE CORN CROP.

Wilber F. Stiles, Lake Mills.

Were I to have my choice of land upon which to grow corn I would take a sandy loam on a southeastern slope that had produced a crop of clover the previous season, and give it a liberal dressing with barn-yard manure in the fall and early winter. With these conditions and proper cultivation we should get a bountiful crop most seasons. Corn can be grown, however, on most soils if proper care is taken. As various soils require different treatment no rule can be laid down that will meet all cases. Only general principles can be given and special application must be made to meet particular cases.

One of the chief factors in securing a good crop is good seed. The success or failure often depends upon this. The seed to be the best should be gathered in the fall before the corn is cut. Then the best ears can be taken. When the corn is put into the silo the largest ears may be broken off; then husk and save the best. The seed should now be placed in some dry, warm place where it will be thoroughly dried and then stored for the winter in a dry place. Leave the corn on the ear until spring, and then shell either with a sheller or by hand.

The manure. The best way to apply the manure to the corn land is to spread it when drawn, unless the field be very sloping and there is much ice and snow on the surface. Where the stables are cleaned each day, on a sled or wagon, which is the practice of some of the best dairymen, the manure should be drawn direct to the field and spread. Very little if any will

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be lost by washing. The soil will thaw out fast enough to take up the fertility.

On clay soil it is not best to draw on the manure when it is wet and soft, for it is liable to be injured as much by packing as it will be benefited by the manure. Clay soils should be kept as loose and porous as possible. For that reason clover is an excellent crop to grow upon them.

Time to Plow.—It will depend somewhat upon what the previous crop was when the land should be plowed. If there is nothing growing upon the soil it is usually best to plow in the fall. The fall plowing should be a little deeper than usual in order to expose some new soil to the action of the frost. The freezing and thawing will help to disintegrate the particles of which it is composed and thus fit them to become more available plant food. By "a little deeper" I mean from one half to one inch deeper than the usual depth. Another point to be gained by deep plowing is that the soil becomes loose deeper and is thus able to hold more moisture in such a form that it can give it up to the roots of the crop when needed. When the soil is porous to a greater extent the air can penetrate more freely and thus more readily do its work of liberating plant food.

If there is a crop growing upon the land it is best in most cases not to plow until spring. The roots of the plants will check the leaching of the fertility and thus keep it near the surface where it can be used by the corn crop. If the soil is inclined to wash the mat of growing roots will tend to prevent it.

The spring plowing should be done as early in the season as the soil and other work will permit. The object of early plowing is to retain as much of the moisture in the soil as possible. When we take into consideration the fact that it requires three or four hundred tons of water per acre to produce a good corn crop it can be seen how necessary it is to retain as much moisture in the soil as possible. A few days of dry windy weather dry out our field much faster than we imagine.

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A few days' delay may cause a marked difference in the yield of the crop. The surface of plowed land dries out sooner than unplowed, and thus warms up quicker and planting can be done earlier.

Where the plowing is delayed too long the growth of weeds and grass may become so thick as to make a mat that will, when turned under, completely check evaporation.

Time to Plant.—The Indians were guided by nature in many things, and their rule was to plant when the leaves on the oaks were as large as a squirrel's foot. In southern Wisconsin I believe that any time after the first of May is safe. I have always had the best success with early planted corn. The early planted corn stands a better chance to get a good root growth before the summer drouth comes on. A frost in the spring is not as detrimental as one in the fall.

Preparation of the Soil.—The soil should be thoroughly prepared before the corn is planted. I think that in a dry time it is a good practice to go over the field with a light harrow just before the corn is planted. This will leave a soil mulch at the surface after planting and will thus aid in checking evaporation. The treatment of the soil after the corn is planted will depend to quite an extent upon the condition of the weather and the nature of the soil. If it is wet we can do nothing with it for a time. It is the dry spell, however, that we suffer most from, and we should know what treatment is best in these cases. One of the best implements to put on the field at first is a light harrow. Go over the field with this a few days after the corn is planted. The object of this is to check evaporation of moisture and also to kill any weeds that may have started. On most soils it is best to keep the field harrowed once in four or five days until the corn is from two to four inches high. Do not harrow when the surface of the soil is wet or when the dew is on the plants. In the afternoon is usually the best time. Always keep in mind that killing the weeds is the secondary object in harrowing corn. To retain as much of the water in the soil below is the chief point to be gained.

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Cultivation.—When the cultivator is started let it be somewhat shallow, close to the plants. In the center of the row it may be deeper. The surface should be kept as level as possible. The more the plants are hilled the greater will be the surface of the soil which is exposed to evaporation.

It is best to cultivate the field quite often. A crust should never be allowed to form at the surface, for when this is the case the capillaries by which the water drawn up from below come to the surface and evaporation goes on very fast.

What we should aim to do is to get as much of this water, which is in the soil, to pass through the corn plant before it is given up to the atmosphere. The cultivators should be started as soon as possible after a rain for a little water at the surface, unless proper care is taken, is apt to do more harm than good. Prof. King, of the Wisconsin experiment station, found that by moistening the surface that the loss, shortly after, was greater than when the surface was left dry. By cultivating shortly after a shower I do not mean that I would have the field cultivated when it is wet and sticky, but start as soon as it is dry enough.

I prefer to cultivate the corn fields quite late, through the month of July at least, and if time can be found, once in the month of August. The practice of stopping when haying begins is not a good one.

Harvesting.—How shall the crop be preserved in order to get the greatest feeding value from it? Where it is to be fed to cattle I believe that the best method is to put it into the silo. Run it through a feed cutter and put it in ears and all. If this is the practice the field should be planted in drills having about twice as many stalks as where it is planted in hills, rows both ways three feet eight, and four stalks in a hill. This will not give such large ears but will give more fodder. If the crop is to be put into the silo it should be cut when the ears are just dented. In order to get it all in in the best shape there should be two varieties. When the crop is to be shocked and fed out dry it is best to cut it when the ears are well

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glazed and put up in large shocks and bind them well. When intended for this purpose it is best to plant a little thicker than for the silo. If the ears are all that is wanted plant in hills three feet eight each way, and have from three to four stalks in a hill. These in most cases will do better than four.

Varieties.—The varieties will depend much upon the length of the season. It is best to get as late and large a variety as will mature safely in your locality. When a good variety is found it is best to stick to it and by selecting the best ears try to improve it.

PROFITS OF DAIRY FARMING.

C. D. Eastman, Plymouth.

The possibilities of Wisconsin as a dairy state have yet hardly been attempted, though she abounds in natural resources sufficient for her to maintain the position as one of the leading dairy states in the union, and only requires time and attention to place her dairy capabilities beyond any limit we might now dare to name. According to the last report of secretary of state, Sheboygan county, one of the oldest dairy counties in the state, with her area of only fifteen townships, two years ago produced one quarter of all the cheese produced in the state, and one seventh of all dairy products. Her resources for dairy pursuits are yet unlimited, and her natural advantages, though better than some, are no better than many other counties. This goes to show something of Wisconsin's possibilities as a dairy state when we stop to consider that she contains over fifteen hundred townships;—or, in other words, if the whole state produced dairy products like Sheboygan county she would produce fifteen times more than she does now.

Among other things the profits of dairy farming depend mainly on the kind of cows we keep, how we feed and care for them the season of year they produce most milk, and the care

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and skill with which the by-products are handled. By kind of cows I do not mean any particular breed but they must be of the true dairy type, not disposed to lay on fat but turn the feed which is given them into dairy products. It makes no difference if they are ringed, streaked or speckled, provided the balance sheet is sufficiently in their favor at the scales and at the churn;—neither one is a safe guide alone. In times past, in the older dairy countries the tendency has been to breed from cows that gave the most milk, leaving out the question of quality, and the yield of dairy products to the hundred pounds of milk has decreased. But now the test has come to the rescue and I positively believe by the proper use of it and th scales and by giving due attention to breeding we can do much to improve the quality of our dairy cows.

After having the right kind of cows we must provide for them the best of feed and bestow upon them the best of care possible, and upon these requirements fully more than any others depend the success of the dairy. Their feed should not only be of the best kind, but it should be fed to them in a balanced form. This is, comparatively speaking, a new idea to the average dairyman but it is a very important one, for it has been demonstrated time and again that no matter how sumptuously we provide our cows with feed they will not be most economically fed unless the ration is balanced. The balance suggested at the experimental station at Madison is one pound of albuminoids to seven pounds of carbohydrates; but my cows are of a true dairy type and I find it possible to feed them a rather larger proportion of carbohydrates and not induce them to lay on too much fat. According to my way of feeding the balance of the ration should be changed somewhat during the year, that is, a cow should be fed a ration rather heavier in fat for four or five months after calving than during the remainder of the milking season. Because during this period if she is a true dairy cow it is very natural for her to give a large flow of milk and it is necessary her feed should be rather heavy in fat or she will lose flesh.

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Besides being fed properly, our cows must be sensibly treated and cared for. I once heard Mr. C. R. Beach, of Whitewater, say, "I would treat a cow as I would a lady," and it is impossible for me to strengthen that thought; it sums it up in a nut shell. Do away with your whips, your clubs and your dogs, treat her as you would a lady and she will reward you accordingly. Milk, water and salt her with regularity, always at the same time, at the same place, and in the same manner, as the cow is a great animal of habit. They should always be milked in the same rotation and by the same person. I have known men to let their cows into the barn and tie them; as it happened sometimes "Old Brin" was in the first stall, and sometimes "Old Spot;" then one man would milk the first ten cows, another the next ten and so on. Thus the cows were milked by different men and at irregular intervals which is a very erroneous practice. I have water in my barn and have practiced watering the cows there stormy days, but have found that to be a mistake, because if watered in the barn a couple of days they like to drink there so much better, they will not drink well out of doors the following day. The best way is to water them always in the barn in winter time.

The season of the year when cows should be fresh depends upon the owner's surroundings. But for the man who has a warm and commodious barn, who lives near a factory or who has ability to economically manufacture his milk into butter or cheese on the farm, I believe the most profitable time of year for his cows to be fresh is in the fall, unless he is supplying a special trade and must have about the same amount of milk the year around. The object should be to make most milk when it is highest. For me furnishing milk as I am now to a factory, I prefer to have my cows if I could have them do to suit me, all drop their calves the first day of October. This mode of dairying gives the farmer more time for haying, harvesting, thrashing, caring for the corn crop, and when this is about done the dairy season begins. Cows that come in in the fall do not have a natural tendency to go dry as long as those

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that are fresh in spring, because during the latter part of the milking season they are on grass instead of dry feed.

In connection with this there is another thought worthy of mention. Many dairymen who practice summer dairying are in the habit of selling what cows they have to dispose of in the fall of the year, which is contrary to good practice. If these cows were wintered the milk would pay for their feed, and the cows will bring at least double in spring what they did when sold. The farmers of Wisconsin during the last ten years have lost thousands of dollars in this way.

After butter or cheese has been made from the milk many farmers are negligent in making use of the skim milk or whey, considering it not worth bothering with. I even know of dairymen who do not attempt to raise what pork their families want to eat. The income from the skim milk or whey if properly fed very materially increases the revenue from the dairy. There is no farmer in the world can grow hogs as cheaply as the dairyman, because in skim milk or whey he has the cheapest kind of nitrogenous food to form a balance with some fat producing food, which is very essential to pork making or calf rasiing. I have made many experiments and consider the whey in practical feeding worth at least half as much as skim milk, but if whey is fed to calves it must be fed sweet. According to my experience, whey is worth about ten cents per cwt., and skim milk about twenty cents per cwt., for feeding growing hogs, varying more or less according to the condition under which they are fed.

Besides the cash receipts from the dairy it is continually increasing the fertility of the soil which profit we receive in an indirect way and can hardly be estimated, but the universal verdict is the more cows we keep the more we can raise.

In what I have said you have an outline of my mode of dairying. Last year I milked twenty cows, five of which were two-year-old heifers, and four of them three-year-olds. These twenty head produced a little over one hundred and fifty thousand pounds of milk for which I received a trifle over fourteen

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hundred dollars net cash. This is what I got after the cost of making had been deducted, but in most reports of herds we get the gross income which would increase this amount at least one hundred and fifty dollars. Besides this I realized two hundred and forty dollars for my skim milk which once and a half paid for what feed I bought. There were forty dollars worth of calves sold and one hundred and sixty dollars of beef cows, that the five heifers took the place of, which makes a total of $1990 for my herd for a year.

VALUE OF A DAIRY RECORD.

C. S. Arnold, Lake Geneva.

At the closing Farmers' Institute at Menominie where were gathered many dairymen from all over the state, the question of how many kept a milk and butter record of each individual cow in their herd brought out a show of only eight hands. This shows that only a very small proportion of the farmers of the country know which of their cows pay for the feed they eat and which ones they are keeping at a loss. I venture to say that not one of those eight will ever give up the practice of keeping a record and I venture to say further that within five years four fifths of the dairymen in the country will keep some sort of a record that will show to them what each cow in the herd is returning to the owner in payment for her feed and care.

The average Wisconsin cow is said to produce 125 pounds of butter in a year, scarcely enough to pay for her keep. If every dairyman would wake up and take the little pains necessary to know the product from each cow it would not be five years before the average Wisconsin cow would produce twice as much butter as she does today, and yield to her owner four times the profit. No man will question but that it is a good thing to know how much milk each cow produces in a year, also how much butter.

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Most farmers think they can guess near enough which of their cows give the most milk but they can't even do that. Just because one cow gives the biggest mess when fresh, it by no means follows that she will give the most pounds of milk throughout the whole year. And when it comes to guessing as to the richness of the milk the farmer without a Babcock "isn't in it." He could as easily tell how many codfish were in the Atlantic ocean by tasting the water to see how salty it was.

Too much trouble to keep a record? Not half so much bother as you imagine it is, my friend. At any rate it is not half the trouble I expected it would be when I began. Let me tell you how easily it is done.

Buy numbered metal tags costing about four cents each and number all your cattle. Get a blank book worth ten cents or a quarter and make entries something like this sample taken from my book:

No. 5.—Dropped March, 1888.

Bo't Fabian's Auction March, 1890, $16.75 in milk.

Fresh Nov. 4, '91. Dry Jan. 2, '93. 5420 pounds milk; 336 pounds butter.

Fresh March 14, '93. Dry Dec. 4, '93. 5545 pounds milk; 349 pounds butter.

Fresh Jan. 29, '94.

In the stable in the handiest place hang up a pair of 20-cent spring scales, set the milk can below and on the wall tack up a sheet of paper ruled in squares with the days of the month across the top and the numbers of the cows down the left side. As each cow is milked hang the pail on the scales, mark the number of pounds of milk on the record sheet, dump the milk into the can and go for the next cow in less time than it takes to tell it. Once each month a sample is taken of each cow's milk and tested with a seven dollar Babcock in about an hour's time. This test added to the test from the previous month's record and divided by two gives the test used for the current month. This is done to get a more even and accurate test

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throughout the year. At the end of each month a sort of balance sheet is made up showing each cow's milk yield for the month, test, butter yield for the month, total pounds of milk and butter from time of freshening to date, and number of months the cow has been in milk. This is my record for February, given simply to show how it is done:

No. of Cow.	Milk for Month.	Test.	Butter for month.	Butter to date.	Milk to date.	When fresh.
	Lbs					
7	235	5 20	19	467	7,283	Nov. 11-91
24	250	4.	12	117	2,511	Apr. 18-93
25	400	4 70	22	238	4,736	Apr. 25-93
35	230	5 80	19	219	3,742	Apr. 26-93
22	270	4.35	14	160	3,213	May 17-93
39	310	4.10	15	157	3,240	June 26-93
14	510	4.85	29	238	4,176	July 25-93
10	420	4.50	22	84	1,475	Nov. 21-93
15	930	3.50	38	123	2,[illegible]92	Noe. 25-93
17	630	5.60	41	70	1,019	Jan. 12-94
27	480	5.60	31	47	710	Jan. 17-94
20	570	4.50	30	38	710	Jan. 20-94
5	870	5.30	34	46	910	Jan. 29-94
36	600	5.	35	35	600	Feb. 10-94
18	85	4.74	4	4	85	Feb. 20-94

Only three, Nos. 14, 15 and 5, are mature cows; the others are first time in milk or just beginning second year's work. It will be noticed that No. 24 has been in milk ten months and has produced only 117 pounds of butter, while Nos. 25 and 35 milking about the same length of time, have produced twice as much butter. The three are about the same size and first time in milk. I may add that No. 24 is being fattened and will soon go to the butcher.

Not the least value of the milk and butter record is its tendency to make the stable man more methodical and more careful in feeding, watering and milking. An increase or decrease in amount of milk stares him in the face at every milking and he very soon learns to know the causes, whether a change in

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weather, feed or water or care in milking, and knowing the causes he is able to so manage his herd as to get the most possible profit from them. I am satisfied that I get enough more milk from my cows to much more than pay for the little trouble of weighing the milk.

To the owner of cows who does not do his own milking the record is invaluable. By occasionally looking over the record book he may know as well the value of each cow as though he milked them himself all the year round.

POULTRY FOR PROFIT.

W. H. Rose, Fennimore, Wis.

In order to raise poultry you must first hatch the chicks. If you do this, either with the incubator or the old biddy, you should use much care. The more thought and care you take in the matter, the better will be the results. If you use hens to do the hatching, you should begin the fall before in making your house warm and comfortable, so that the hens will lay most of the winter, thereby inducing them to become broody, early; say, the first of March, set as many hens as you can at a time in a room by themselves. After they have set two or three days, quietly go in the evening with a light, and examine every egg. Remove all unfertile ones and give each hen as many fertile eggs as she can handle. Have some fresh eggs handy to fill out with, and if you have used a tester and done your work well, you will find you have saved considerable valuable time as there is usually about one fourth of the eggs which were not fertilized. These unfertile eggs can be usd for nest eggs or kept for the chicks. They do not spoil. In fact I have subjected such eggs to 103 degrees of heat for 21 days and at the end of that time, found them pretty fair yet; while on the

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other hand the egg that will hatch readily begins to spoil the moment the heat over 90 strikes it.

When your chicks begin to break the shells, don't get nervous and disturb the hens; let them remain as quiet as possible. The chicks will be much stronger if allowed to remain in the nest 24 hours after they get out of the shell. They should have absolutely nothing to eat or drink for 24 to 36 hours; during that time they subsist on the yolk of the egg, from which they were produced. When they are old enough and dry and nice take them out and give as many to each hen as she will be able to cover and keep warm.

The coops should be all ready when the chicks are, and should be made of good boards, warm and dry. The lath on the front side should run up and down, and be no nearer than will prevent the old hen from getting out. These coops should be about two feet square, with a good slope to the roof and a hinge door in front to shut down nights and stormy days.

In feeding little chicks, is where most people make mistakes. They feed too much at a time and usually the wrong kind of food. About the first thing they do after having their little birds, is to make for the meal chest and get a panful of meal, add some cold water, stir it up and they are ready to fill their little crops with a mixture that has killed more little chicks than all the insects combined. If people would only think a little they would soon come to the conclusion that the chicken's gizzard was made to grind feed and would feed accordingly. If you must and will feed corn meal dough, take boiling water to mix it up with;—well baked corn bread is far better than either. Perhaps the best feed for the first day or two is hard boiled eggs, chopped fine, shell and all; after that shrunk wheat, cracked corn, or foxtail seed is much better than any sloppy feed for they will grow muscle on it. The main thing to feed for is health and growth. The most healthy chickens I ever raised, never ate a spoonful of soft food in their life. It is very natural for fowls to prefer variety and to be all day getting a crop full. You may feed liberally of anything they like in the

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morning, repeat it at noon, and again at night, and they will not do nearly so well as when fed little and often.

While the little chicks are with the old hen, it is a good plan to keep her old crop full of whole corn, so that she will not be continually eating the dainty morsels you may place there from time to time for her brood. As the weather warms up in the spring, the coops should be moved in or near the garden, where the little fellows can have access to all the insects that infest all growing plants; they will keep them pretty well picked off and will not disturb any of the plants until they get to be pretty good sized chicks. About the time the cockerels begin to crow they should be separated from the pullets. They will grow much faster and the pullets will do much better and begin laying two months earlier.

In regard to keeping male birds with hens, where eggs for hatching purposes are not cared for, the New York Experimental station gives very good advice in a recent bulletin. A series of experiments have been carried on the past season to determine whether the idea, that male birds are necessary to the production of fresh eggs is true. The idea is quite prevalent among farmers, and often gets into the farm journals that prompts the inquiry, "How many roosters will I need with my flock to insure plenty of fresh eggs?" I always answer not any. At the station the pullets that were separated from the males long before they reached maturity, commenced laying from one to two months earlier than those mated with male birds, and laid 22 per cent. more eggs during the season. Taking this to be the average experience, what a damage and bill of expense the many cockerels are during the fall; better shut them up and feed two or three weeks and sell them even if they are not full grown rather than have them harass and injure the pullets.

When the pullets are by themselves, give them quarters that are absolutely clean, with a good range or supplied with plenty of green food, and an occasional feed of lean meat.

Four years ago this winter I made an experiment with eight

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varieties of chickens. I had a pen 80 feet long, divided into eight ten-foot rooms. My object was to determine 1. Which was the better winter layer. 2. Could the S. C. Brown Leghorn be classed among the layers. As I said before, the pens were all ten feet wide, but the first was longer than the others; it run back eight feet further under a hay mow. In that pen I put 22 Leghorn pullets; next, ten light Brahma hens; next, 12 Barred Plymouth Rock pullets; next 15 Langsham Houdan pullets; next, 8 American Dominiques; in the last pen I put 12 Silver Spangled Hamburgs. When I fed one flock I passed right along through and fed all the others, the same as to cleaning the pens, watering the fowls, etc. In fact they all fared exactly the same. The results were very satisfactory in a financial way as I had a contract for 30 cents per dozen for the eggs, and most of them did nobly. The egg record I have lost, but what I remember and started out to determine, is one of the fixed things in my memory. The Light Brahmas and the Langshams were about equal; Plymouth Rock, third; Wyandotts, fourth; Houdan, fifth; Dominiques, sixth; the Hamburgs were not in it, but the S. C. Brown Leghorn pullets were way ahead and out of sight. I remember distinctly, that in three cold days in January, the 22 pullets laid 56 eggs. You must bear in mind, these pens were warm, water seldom freezing over night. In my opinion, it teaches one thing plainly: the hen is simply an egg machine, and if in proper condition, fed the right kind of feed, water, light and warmth supplied, she must either lay or die, and most of them prefer to lay.

Ordinarily eggs cut quite a figure in the poultry business on the farm, and there is no trouble in getting prices from this time on till March and the first of April; but to get 20 cents per dozen, from that time on until November, requires a little more thought and trouble.

Since I learned that an unfertile egg keeps better than a fertile one, I have had no trouble in getting good prices for eggs that are laid during summer. As soon as the breeding season is over kill off or remove every male bird on the place.

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Gather your eggs fresh every day. Have some cheap, clean barrels or boxes ready, also a barrel of dry salt. When you come in with the eggs, go directly to the cellar with them, where your boxes and salt is. Cover the bottom, about an inch deep with salt. Now take the eggs one at a time and gently press them, big end down into the salt. When you have covered the surface with eggs, touching each other, cover them with another layer of salt, and so on up until full. In November your eggs will be in good condition; all the trouble you will find will be to wash the salt from them carefully. Your barrel of salt will do for another season or better perhaps, feed it out to the stock. There is one extra precaution, be sure all the eggs are fresh and no cracked shells.

The question is often asked, Can there be an overproduction in the products of poultry? Of course there can be more poultry and eggs grown, than the immediate and convenient markets can consume, just as there is at present in the wheat, the home demand is more than met, and the surplus has to hunt a market elsewhere. Quality has much to do with the business. There is a large field open to those who aim to supply the market with the best. There is something more to look after than feeding and caring for the fowls. To produce the best, the hens must be fed the best. This demands the use of the improved breed. No farmer can afford to raise chickens for market from the common stock, for the reason that no system of feeding will enable the inferior birds to equal their superiors. With the breeds for the purpose, the markets can be supplied with something choice, and there will be little or no competition.

Overproduction of the best is a result not yet attained and will not be until there is a radical and improbable change in the method of the great majority of those who make poultry a mere incident in the productive economy.

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SUCCESSFUL MANAGEMENT OF HOGS.

A. Selle, Mequon, Wis.

For many years the hog was an object of general contempt, and usually when pork is low, it is spoken of in a degrading manner, as if it were the outcast of animal kingdom; and it is a general custom to connect dirt and nastiness with the name of hog, under the erroneous impression that it enjoys filthiness. But whoever takes the trouble to observe the habits of the hog carefully will find out to the contrary, and conclude that hogs have the same desire for cleanliness as any other domestic animal.

The hog will never treat himself as cruelly as some Christian men treat him, for he is not naturally a dirty animal, although he is as filthy as any, if compelled to be so. The hogs best manifest their sense of propriety in a clean, well kept stable by always depositing their excrements at the same place or corner. Every careful hog-breeder knows that hogs will not thrive in dirt or filth, but will decline physically and mentally, and that it will take almost superhuman exertions to bring them up again to the normal standard. Although the hog will lie down in a mud-puddle to cool himself, he will never have his resting place other than in a clean, warm, dry place, if he is allowed to look out for himself. It is especially important to hogs that they always have sufficient and clean bedding on which to lie down and take life easy, and a soft bed of rye straw is a luxury, which a hog will appreciate as well as his master does a feather bed.

Success in hog raising depends a great deal upon the study of the subject, the selection of breeding, and the attention paid the sows, before and after farrowing. A certain inclination and love for that kind of work is necessary for successful hog raising, and one should not depend too much on luck, as hog business is no lottery scheme; and besides there are two lucks,

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a good, and a bad one. Every intelligent farmer will soon learn that a pig should grow continuously, from the day it is born until the day it is butchered, if it is to yield a maximum profit at all, and any man who hates a hog had better let hog raising alone.

The manner of hog raising and the kind of breed most profitable for each particular farm cannot very well be indicated, as I do not like to get into trouble by making individual distinctions, so it must be left to each one's own fancy and preference to select a breed most profitable and according to the local demand of market. But I would not advise any one to buy a breeder from a show yard, for this is much like selecting against success.

One of the most important points is, to keep the hogs in a good and healthy condition, and I believe it would be in most case in the interest of hog-owners to acquaint themselves with the physiology and hygiene of hogs, especially their diet and proper care. Then all questions, as, what remedy to apply in such and such a case of disease would not arise at all; and why not? Because we know the requirements of the animal and constantly learn to know them better. Such hog knowledge will be improved by observing and studying, and we will come to the conviction that the above said knowledge of the constitution and requirements of hogs makes the application of any kind of medicine entirely superfluous. This opinion may astonish a great many, for it is an old time-honored notion of many farmers that when an animal is sick, the only cure is medicine, respectively a mixture of all kinds of poison.

Too little attention is paid by most farmers to the stomach of the hogs. It is supposed that they can get along on any kind of food and also that they can suffer without any food for a long time. This inattention is mostly the cause of the various prevalent diseases among hogs, consisting generally either of diarrhoea or constipation. Regular doses of salt, ashes, and charcoal will do a great deal to keep the hogs in good appetite, perfect digestion, and prevent disorders of the intestines. Hogs

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often suffer indigestion caused by over-eating. If in such cases the above named remedies are in reach of them their own instinct will lead them to eat of them, and diarrhoea is thus in many cases prevented. In the summer or in the pasture when hogs can reach the soil, they mostly cure themselves, or by eating grass, etc., which is aperient.

The great success in hog raising does not depend alone on the kind or breed, and the care you give them, as does the time you have the sows come in. Any intelligent farmer knows the length of the period of gestation with the sow. By noting the date of coition, you can tell almost to a day when a sow will farrow, as they are very prompt, on time, more so than any other animals. At the time of breeding, the sow should be in a healthy condition, but not too fat. I am satisfied that a good many make a mistake by giving the sow too much concentrated food and not enough exercise. If the sow is too fat from corn, I think this is a cause of the small litters of which some breeders complain.

After the sow is bred, feed her so as to have her in good, strong flesh at the time of farrowing. The main object is to keep her bowels open and regular. Should you notice signs of constipation, which is not likely when fed too highly, you can easily relieve it by feeding a little oilcake meal or a small quantity of cracklings, the offal of lard, by pouring water over them and letting them stand over night, then feed it in their slop about a quart three or four times a week. This is an excellent thing to give a few weeks before farrowing. Those having a supply of roots or beets, will do well to feed them every day, as they are an excellent substitute for grass.

Next comes the farrowing time. It is best to have each sow in a separate pen in which she should be placed a week before farrowing, in order that she may get used to it and not be fretful. Have her bedding well worked down and do not use too much long straw. The first day they need little or no feed, some water will do. Feed lightly for a few days and don't commence to stuff them at once with rich feed or slop, but give

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them some warm water and increase the quantity of food gradu, ally, until up to the full allowance. Do not make sudden changes in quantity or kind of food, as all do not require the same amount and no iron-clad rule that will fit every case can be laid down; here the feeder must use some brains and common sense. If the sow gets too much and too rich feed or slop, and is fed at irregular hours, scours in the little pigs is often the result; a dirty pen may also be the cause. Should there be trouble in this direction, I usually give a tablespoonful of ginger or rice water in their slop daily, also plenty of charcoal, and keep them in a warm and dry place. Change the bedding every day it if smells badly and you will soon see the difficulty pass away, leaving no bad results.

Pigs, like children, suffer more or less at teething, when two to four weeks old and scours are sure to result if precaution is not taken and feed given regularly, also dry bedding, sunshine and exercise provided. To prevent the strong and bad smell in stable, it is to be recommended to take an example of the dairymen and scatter some land plaster and air-slaked lime in their bedding and surroundings, for nothing is as hurtful for little piggies as the foul effuvia caused from the liquid manure, etc. When the pigs are three weeks old they usually commnce to eat a little and I find it a good plan to have a hole for the pigs to slip through into another pen, where I can feed them skim milk, cracked wheat or corn. I find to give them some fine chopped cracklings mixed with a shovel full of dry earth, place it in that side pen, and in a short time they will have turned it over and over, in order to pick out the cracknels. This gives them plenty of exercise, their bowels will be in good condition and you can rest assured that they will not be troubled with thumps. From this time on, you may use less brains but instead give them plenty of good rich slop, made of fine white middlings bran. Ground corn or peas, and for a change, whole corn or peas soaked or coarsely ground and fed dry. But do not forget to give them daily a little oil-cake meal and lobbered skim milk.

We all know that bran will increase the flow of milk, but last year I commenced to feed brewer's grains mixed with fine middlings and linseed meal, and discovered that as a milk pro-

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ducing food the grains are ahead and "take the cake." One objection to these grains I find if fed too liberally to sows before they come in and if the sow is naturally of a good milking strain, and she happens to have only a small number of pigs in litter then we want to look out, as the grains make too much milk for the little ones to take and the udder will easily cake.

One important part of my subject is feed, and what shall we feed? The answer might be: Anything grown on the farm for you cannot turn up anything that a hog would not eat. But when corn is over 50 cents a bushel, mill feed $16 to $18 a ton, and hogs are too low for profitable feeding, it looks as though we had better invest in mills and warehouses and let hog raising take a vacation. At any rate, every farmer should raise his own supply, for he who has to buy his feed is just as poor an economist as the one who sells much feed and keeps his animals half starved. But the farmer who sticks to the opinion that all food eaten by his animals must be grown on his farm, is also on the wrong road.

To be guided by a certain rule for feeding, from one year to another, is almost impossible, because some grain may be fed with profit one year and may be the most unprofitable another year. Some feeders recommend oats as one of the best bone and muscle making foods. This is true enough, but as there is too much hull, especially this year, I find it to be the most expensive; still feed a little coarsely ground, just for variety. I sold several tons of oats at $21 per ton and bought fine white middlings at $15.50 per ton. The time to buy mill feed is when millers have lots of it on hand and offer it for sale, which is usually in harvest time, and farmers should take advantage of it. Another important point is successful fattening and the sole end of hog breeding is to obtain a large quantity of meat of good quality in as short a space of time as possible. A cheap and quick fattening depends greatly upon the health and age of the hogs, as well as upon the season and condition of the food. Pigs brought upon a good pasture with some by-products will have a big frame and be strong of muscle at six months. Accustomed to digest grass and bulky food, they fatten rapidly on corn and pea meal and make quick and cheap pork.

Whether the grain should be ground or fed whole or soaked,

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there are still different opinions. I never got good results from peas, rye or oats when fed whole, and I think corn is the only grain that can be fed successfully unground. The excrement should be watched once in a while and if corn passes whole or only partly digested, it should be ground or soaked. When the hogs grow fatter and come nearer to finishing, the digestive power of the hogs seems to grow weaker, and then always grind the grain or corn as fine as possible and if plenty of milk is at hand, soak it in milk about twelve hours before feeding, to have it acquire a little acidity which makes it just to the taste of the hog's stomach; it also aids digestion and stimulates the appetite.

In conclusion I wish to say to those starting in the business of breeding, that your best effort is none too good and it will be necessary to give the business your personal attention and not be afraid of soiling the fingers or clothes, to wait upon and take care of your pets.

FEEDING AND HANDLING HORSES.

Frank Sutherland, Madison.

The feeding and handling of horses is something that most of us have done nearly every day of our lives since we were old enough to put on a bridle, and there at once arises the query, What is there about it to learn?

When we look about us and note the difference in horses of different people, we at once discover that the methods of some far excel those of others. One man's horses are always well conditioned, another's poorly. One man's horses are rarely ailing, another's nearly always; so some always appear laggardly and lazy, others always the reverse. Some are gentle, others anything but gentle. To bring out the better methods, and find wherein the poorer lies, is the object in the present instance. The horse is a domesticated animal, and like all do-

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mesticated animals is naturally shorter lived, and subject to more ailments and diseases than is the wild animal. But a horse properly fed and handled, should perform the ordinary labors for which he is qualified, for from ten to fifteen years, with but very little intermission on account of ailments not the direct result of his labors. As to feeding horses there is a wide range of foods relished by the horse, that every farmer may produce and nearly all of which are good under right conditions. The whole list of grains and grasses, either green or dried, are on the approved list, but economy and the bad results liable to follow the continued or excessive use of some grains has limited the number to comparatively a few for common use. Oats are nearly a perfect food for the horse in health. While it nourishes every part; produces a fine appearanc, and is relished by the animal, it gives him abundant spirit and endurance. Corn is another grain in common use. While it will usually be found a little cheaper than oats it can not be recommended as a steady grain. Its use will be found to produce a little sluggishness, and rather too much heat for warm weather. As a winter grain for work horses its use will undoubtedly be found satisfactory. In the large stables of our large cities where expense in keeping is an important item, and the matter is studied in its fineness, ground corn is usually a part of their daily grain ration, and hence must be considered one of the important grain foods. In feeding the immature or growing animal corn is the one grain that should be rejected. In the colt the object first in mind should be development—development in its perfection, if possible. While the breeding of the animal will in a large measure determine his style and appearance, his daily measure of meal will be found to have played an important part in future soundness and health. We wish the best muscular and bony organization, hence his food must be of the muscle and bone forming sort. If to a liberal feed of oats there be added an equal bulk of wheat bran, a frequent feed of something succulent such as carrots, potatoes or ensilage, where it can be had, we have a ration for the colt that should develop a well rounded body, with full muscles, good joints and clean limbs. If your colt has been corn fed you may expect softer bone and fat in place of muscle. Timothy hay is most fre-

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quently sought for, for horses. It contains all the elements necessary for a good hay and is more apt to be found free from dust and mold than any other kinds of hay. It has been our practice, however, to feed mixed or even clear clover, when timothy was not at hand, and have yet to know of any evil resulting from it,but on the contrary have regularly noted an improved condition. I would not recommend this for driving or road horses, but for horses doing slow or farm work I think it will be found satisfactory. With the driving horse, while his food should be sufficient, it should be of the smallest bulk, that it may in no way interfere with the freest action of the lungs.

Matured horses that are to be carried through the winter, with little or no work, may be fed very cheaply on oat straw, or stems from the sheep rack and a little grain. Some have wintered on hay alone and report good success.

Every horse owner should note carefully the condition of his horse at feeding time. Guard carefully against watering or feeding when hot or exhausted. This is a frequent cause of cholic, the most common ailment of our horses.

The horse in good condition should appear bright of eye and coat, head and ears carried well, breath and stable sweet, and prompt in his actions. Any departure from these should be noted, the cause sought for and remedied. Often a change of food or a day's run in a wood's pasture will remedy a difficulty if taken in time, that might cause serious trouble if allowed to continue.

The horse has been an almost constant companion of agricultural man for over three thousand years, and for about the same length of time has drawn the chariots of war. We must then concede to him an important place in shaping our modern civilization. We find him today so closely interwoven in our domestic lives that we wonder if inventive genius will ever replace him and what it will be like. To the Arab belongs the distinguished honor of having first brought the horse to a high condition as regards form, endurance, docility and intelligence, and it is quite doubtful if the modern horse excels him in any of these qualifications, especially in the latter two. The intelligence and docility of the horse depends largely upon his breed and breeding, but more yet upon the man and manner, from

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whom and in which he receives his education. In fact I think we are apt to find our horses quite the reflex of our own natures; so much so that we often fancy we can depict a good bit of character from the horse or team a man drives. In developing the education of the horse we should constantly bear in mind that he is a creature of affection, also of intelligence and retentive memory. An injudicious jerk of the rein on the tender and bit sore mouth or an angry stroke of the whip may for all time injure the future usefulness of your horse. It is much easier to spoil a horse than to cure him of a bad habit after it is once formed.

The handling of the horse should commence in his early colthood. Accustom him to your presence and soon to the head stall. It will then take but a few minutes to learn him to lead, at the side of his dam, going to pasture or work. When convenient to watch him for a few minutes tie him to a strong manger, also at the side of his dam; he will usually struggle but very little if he has been previously taught to lead. The winter before he is three years old, if a spring colt of good growth and maturity, he should be prepared to take part in the work of the following season. I would prefer he should be moderately grained, enough so that he may have courage and spirit, but do not grain heavily unless you have steady employment or the colt is in poor condition. I usually commence the harness work with the bitting harness. This is put on loosely for not more than one or two hours at first, and he is turned loose in the yard. Gradually lengthen the lesson until he can wear it three or four hours without becoming tired; tighten the check and side straps until the head is carried about right. In this way he will become accustomed to the bit and check rein and will learn to move and turn, carrying his head in the right position, and it has taken but very little of your time. The next move is to put him in the work harness, beside a quiet, free moving horse, and drive him about until he has learned to rein, to go, and stop at the word. He is then ready to be hitched up. The day he is to be hitched up I would work him in some way until the keen edge of his spirits are worked off; then hitch him to whatever is thought best and drive him till quite tired. The next day he may be hitched up with less preliminary work and

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so on. When once commenced with he should be used every day until thoroughly broken. If he can not be used he should be turned out. Idleness with the horse as with the human family is a fertile field of mischief and vice, and steady employment at congenial labor will be found as beneficial to one as to the other. Be watchful; it is always the unexpected that happens. Endeavor always to be in the mastery. If he is naturally vicious or head strong, provide snaffle or "Rarry rope" that he may be kept well under control. Never fail to give your colt an encouraging word or a pat as soon as he shows a disposition to do as you are trying to have him; he will soon learn its meaning and try to win it. Give him reason to have confidence in his master and it will not be found wanting. Kindness will pay a hundred fold, and firmness, perseverence and a mountain of patience are good stock in trade when handling the colt.

A few minutes' time should be given daily to the coat of the horse. Legs and feet should receive close inspection and be kept thoroughly clean. A little attention to mane and tail will add more to a tidy appearance than the same amount of work applied in any other way. As it is the kindly submission to handling, or nature of the horse, that measures his utility to mankind and makes him a valuable possession, it is also that in which he should be most improved. Vicious, unruly, unsafe horses are far too common. You ask how can we accomplish this object? I reply, by adopting as far as practical the tactics of the half civilized Arab of the desert, whose mare the rich man's money could not buy: She had known but one master, and never should. No hand had been laid on her except in gentleness. The tent roof that sheltered him from tropical suns and desert sands, had been her stall. From earliest times she had received her daily measure of barley from the open hand, had been played with and talked to like children. Until, to use the words of Ilderim, sheik of the desert, in Gen. Wallace's "Ben Hur" there was produced such as are "kings of their kind; of a lineage reaching back to the broods of the first Pharaoh, my comrades and friends; dwellers in tents; whom long association with me has brought up to my plane; who to their instincts have added our wits, and to their senses joined our souls, until they feel all we know of ambition, love, hate and contempt; in

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war, heroes; in trust, faithful as women. I could tell thee marvels done by their ancestors; for the present enough, that they were never overtaken in retreat, nor, by the sword of Soloman, did they ever fail in pursuit."

THE HORSE IN THE FUTURE.

Frank Morley, Baraboo.

I hope you have not already misconstrued my subject. I do not wish to be considered or understood as infallibly revealing the future,—having never consulted the Oracle or acquired magic art,—but simply to discuss the present situation, its causes and probable results. Granting, just now, that the present condition of the horse market is entirely due to overproduction, it would only be "history repeating itself."

We all know that the market prices of cattle, hogs and sheep go away up and then down again like the ebb and flow of the tide, caused entirely by overproduction or short supply. It seems to be the nature of farmers as a class of producers to rush to extremes. If pork is high, neglect all else for the hog; if beef is up, all else for beef; if sheep promise sudden wealth, more sheep. What is the result? If we look at the market reports of bygone years we find that every now and then there has been an oversupply of one or more of these three kinds of live stock always followed by a scarcity.

Why is not this true of horses? Why has this depressed condition been so long in coming? Simply because it could not be brought here any sooner. It has been hurried along with all the reckless speed possible. For the last fifteen or twenty years horses of all breeds, regardless of individual and race defects, have been imported by shiploads. Every stallion with a herd book certificate has been freely patronized. One farmer has

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sought to raise draft horses from his buggy mare because she was a little too small to suit him. Another has been raising trotters from some of his slow dolts for similar reasons or the reverse, without any regard to the requirements of the market. And how many of those who foresaw that they must breed for a purpose have been willing to use any draft stallion that had the only supposed necessary qualification, weight, all other points ignored, or any carriage stallion that could prance and show a treacherous disposition!

Is it any wonder that the despairng cry, "It don't pay to raise horses," is heard at last. The marvelous growth of our nation with its immense manufactories and great commercial activity has furnished a greedy market and long delayed the present low tide. Our horse breeders hurried it along with all the blind, persistent vigor possible. But is it caused entirely by overproduction? I thing not. If it is, then there is an overproduction of cattle and sheep, an overproduction of most everything that men consume and at the same time an overproduction of men also.

It is encouraging to note that the present depression does not put strictly first-class horses of the draft or carriage type below the cost of production. They command remunerative prices even now. It is not safe to infer then that there is not really an overproduction of first quality horses but of the inferior grades. In fact the best class of horses pays better returns for their raising just now than any other kind of live stock, while inferior grades are far short of even apparent profit.

I noticed an article in last week's Breeders' Gazette by that great breeder, Mr. Geo. E. Brown, of Illinois, in which he states that during the last four months he has sent inquiries relative to the horse breeding interest to over 1,000 men throughout the United States. With very few exceptions the replies received state that most of the farmers in their vicinity are giving up horse breeding. It is only reasonable to suppose that they should. Many, very many, have learned to their sorrow that it pays to raise only the best and that they are not the ones who can raise horses, up to the highest standard. Does not this show what is in store for those who having the right kind of mares, continue to breed toward higher standards, being always

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careful to breed for what the market demands. Breeders are realizing more and more that they must breed for a special purpose, either draft or fine carriage horses. I have frequently heard men argue that the draft horse was a dolt, too clumsy, good for nothing, anyway, not worth raising, and I don't like them. Such men heretofore have gone to work to raise one that they did like, but when they wanted to sell, heartily wished they had one somebody else would like.

This is the all important question for those who intend to raise horses for profit. Those who raise them for fun need have no such care. This class, however, are turning their attention to other sources for pleasure now.

While in Chicago the past summer, I took particular notice of the draft horses used by such firms as Swift & Co., Armour & Co., and others who used them extensively and in all probability were willing to pay a good price for what suited their purpose best. I also noticed the carriage teams used by the class that could afford them as a luxury.

The drafters were of the smooth, round-bodied, short-backed, evenly devloped class. The coarse-grained, ill-shaped bulks were conspicuous mainly by their absence from the ranks of the most prosperous firms and their presence on trucks and drays of less attraction. Great weight is no longer the only qualification of the draft horse. Quality is much more essential and the two combined, even at the expense of a little size, is what will command a good round price. The importance of having them low down and blocky can not be too strongly urged.

It requires more skill of the breeders' art to produce a perfect carriage team. It must be well mannered but spirited and dashing, and have a graceful easy carriage pleasing to the eye and in general appearance strikingly suggestive of good breeding. When this great country of ours is again revived to its previous activity those breeders who continue to work on these lines will find a remunerative market. Just how long that will be no one can say but in all probability before the next spring's colts are old enough for the market.

Full blood horses are so cheap that they can no longer be imported, maintained in idleness and sold at a profit as hereto-

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fore. Breeders will save only their best for breeding purposes and I believe that many of the large establishments will find that they cannot keep such a large stock of horses in show condition doing no work to earn their keeping. This will give the average farmer a better chance. They can keep a few good brood mares on the farm and let them work enough to keep out of debt to their owners on that score.

When once possessed of the right mares it costs no more to raise a No. 1 horse than to raise a scrub. The additional outlay at the start will soon be amply repaid. Fifty to one hundred dollars extra invested in a good brood mare is a comparatively small item. Suppose she produces eight colts, which would not be putting it very high, each one will be worth at least $75 more than a poor one, or in the end $600 in her favor. These are not fanciful figures, and ought to discourage any one raising inferior stock. It is an old saying that "it is a good time to buy when every one wants to sell" and I think this is just as true of horses as of any thing else. The man who takes advantage of the present depression to buy good mares stands a better show than for some time past.

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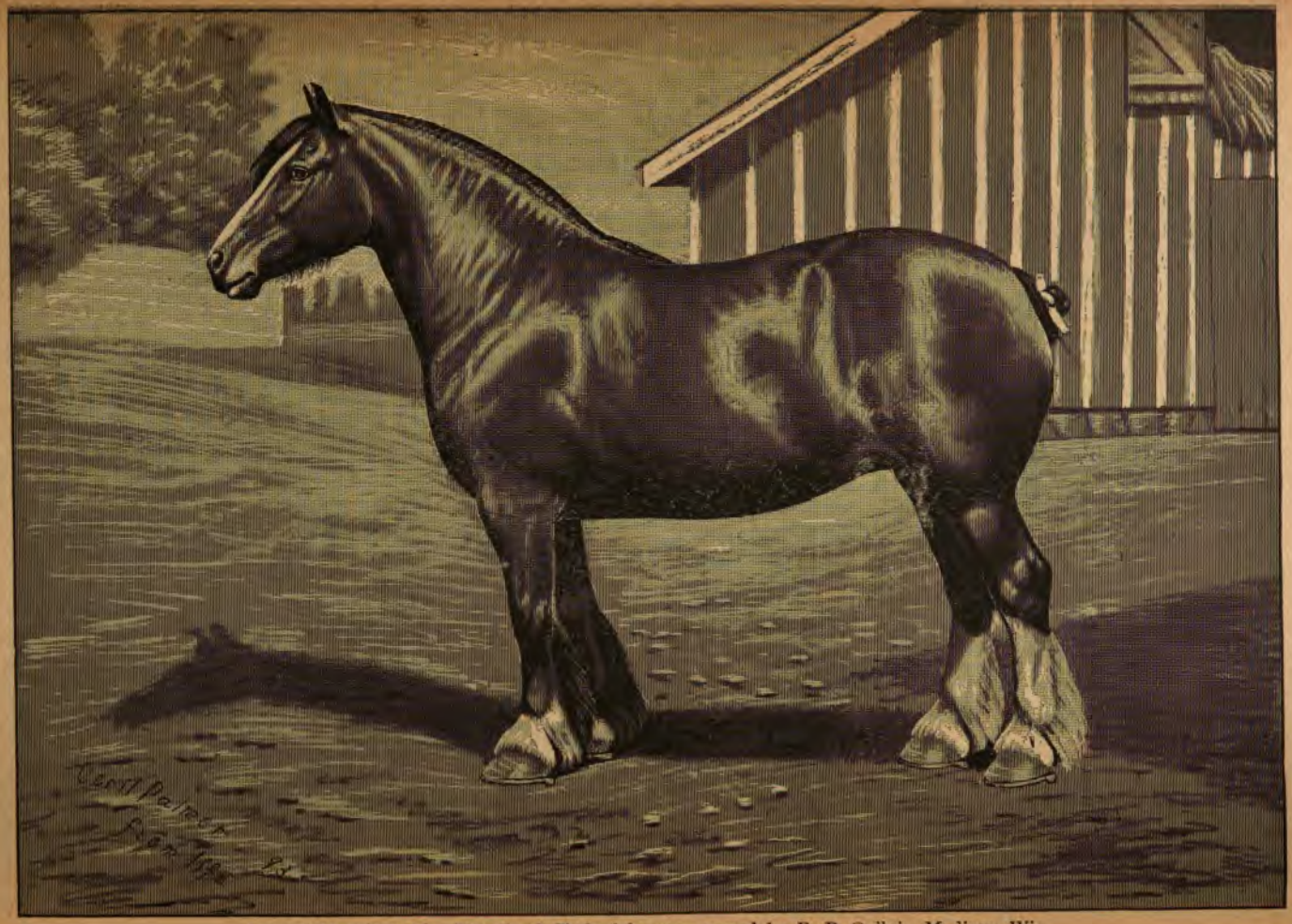

Lass o' Gowrie 4716 —Pure bred Clydesdale mare owned by R. B. Ogilvie, Madison, Wis.

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ONE HUNDRED AMERICAN RATIONS FOR DAIRY COWS.

F. W. Woll.

An investigation of the system of feeding dairy cows practiced by Wisconsin dairy farmers was made in the spring of 1892 and described in Bulletin No. 33 from our state experiment station. As the results obtained proved of considerable importance and practical value, the investigation was continued on a broader scale during 1893, and in the early part of the year circular letters were sent out to more than four hundred dairy farmers and breeders of dairy stock in all parts of the United States and Canada, asking for information concerning their methods of feeding milch cows. The present article is the outcome of these inquiries and contains in a condensed form the main facts brought out bearing on the subject under investigation. One hundred of the farmers to whom the circulars were sent furnished complete rations containing definite quantities of the feed stuffs fed daily to their cows, as exactly as the circumstances would permit. A majority of the rations were not obtained until after considerable correspondence, as many as three letters having in many instances been sent to one party before all the necessary data could be secured. In a large majority of cases it proved impossible to ascertain with reasonable accuracy the quantities of feeding stuffs fed daily, especially as regards the coarse feeds, and many rations which lacked but little of being complete could therefore not be included in this article.

On account of the great mass of data at hand it has been necessary to condense all information as far as possible into tables. The reader is asked to study carefully the contents of both these and the accompanying extracts from letters, as well as the discussions entered upon; figures and statistics are generally considered dry reading, but to the farmer making a specialty of dairy husbandry, and anxious to succeed in his business, they cannot help being of interest, as they may enable him to find out how and in what special directions he may improve.

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The rations are arranged alphabetically according to states; the names and addresses of the dairymen and breeders who furnished the complete rations fed to their cows are given (by special permission), and then the number of cows in milk in each herd, the breed, average live weight of cows, average annual yield of milk and butter per head, average per cent. of fat in the herd milk, the specialty of farming followed, whether breeding or production of milk, cream, butter or beef, and finally, length of time and the season during which the cows go dry.

It may be in order to state in regard to the annual yields of butter and milk given that the reports are apt to be rather high in many cases. While some of the figures given are unquestionably correct, the farmers furnishing them keeping careful accounts and knowing exactly just what their cows are doing, others are more of good guesses than anything else,—and in such cases according to human nature, rather too high than the other way. No theories stand or fall, with these data, however. If a farmer reports an average yield of 6,000 lbs. of milk, or an annual yield of 300 lbs. of butter, we may feel certain that he is doing well, and that his figures are approximately correct, if the other information given, his method of feeding, the kind of cows kept, etc.,—is such as would substantiate the claims made; if the yield reported were 5,500 lbs. of milk or 290 lbs. of butter, our conclusion would be the same.

There is sometimes a discrepancy between the yields of milk and butter reported, and the per cent. of the fat in milk; this may be due to a too high fat content of the average milk of the year being given, or the fact that the butter equivalent of the milk consumed by the family has not been included in the butter yield. In ordinary dairy practice where a separator is used, and where the cream is properly ripened before churning, the yield of butter will exceed the quantity of butter fat produced by about 15 per cent.; 100 lbs. of 4 per cent. milk will give about 4.6 lbs. of butter, 100 lbs. of 3.8 per cent. milk, 4.37 lbs. of butter, etc. Where the milk is set by gravity methods, and the churning is not done very carefully, the yield of butter may easily fall to that of the fat in the milk or even below..

The names of the farmers furnishing the winter rations fed to their herds, with information concerning the management of these are given in the following table:

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American Farmers Furnishing Rations for Dairy Cows, 1892-3.

ABBREVIATIONS—For breeds: A.—Ayrshires; B. S.—Brown-Swiss; D.—Devons; G.—Guernseys; Gr.—Grade stock; H.—Holstein-Frieseans; J.—Jerseys; N.—Natives; R. P.—Red Polled; S.—Short Horns.
For specialty of farming: B.—Production of butter; Br.—Breeding; C.—Production of cream; G. P.—General purpose; M.—Production of milk.

No.	Name.	Post Office.	No of cows giving milk.	Breed.	Av. weight of cows, Lbs.	Annual Yield Per Cow.		Per cent fat in Milk.	Specialty of farming.	Cows go dry, Weeks.
						Milk. Lbs.	Butter Lbs.			
	Colorado.									
1	J. W. Goss	Hygiene	20	J.	900	5,000	340	5.0	C. and B.	None over 8; half not at all.
2	E. B. Haver	Pueblo	90	H.	1,180	9,030	.....	.....	M. and C. for city.	4-6.†
3	C. F. Hunt	New Windsor	40	J. H.	1,025	10,000	.....	4.25	Br. for M & B.	4-6.†
4	W. C. Stiles	Loveland	16	H.	1,100	6,800	270	.....	Br. dairy stock	8, July-Aug.
	Connecticut.									
5	E. S. Henry	Rockville	32	J.	900	.....	375	.....	Br thoroughbred stock & B.	Mostly in summer.
	Illinois.									
6	A. Bourquin	Nokomis	12	B. S.	1,400	.....	415	.....	G. P.	2-4.*
7	J. H. Delancey & Son	Elgin	82	H.	1,200	9,937	.....	.....	Br. & M.	8.†
8	H. B. Gurler	DeKalb	67	Gr. H. J S.	1,000	6,260	271	4.33	B.	8, July and August.
9	J. G. Spicer	Edelstein	30	J.Gr.J H.S.	950	.....	250	4.20	B.	2-3, July and Aug.*
10	I. U. Wetmore	Oneida	6	S. & H.	1,100	.....	.....	.....	M. for cheese factory	Av. 8, Jan.-Apr.*
	Indiana.									
11	Mrs. Kate M. Busick	Wabash	20	J.	800	4,500	300	5.9	Br & B	4, Aug. and Sept.*
12	C. C. Richards	Howland	22	J.	750	5,100	300	.....	M	4-6.†

* Some cows do not go dry at all. † Cows come in at all seasons.

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American Farmers Furnishing Rations for Dairy Cows 1892-3—Continued.

No.	Name.	Post Office.	No. of cows giving milk.	Breed.	Av. weight of cows, Lbs.	Annual Yield Per Cow. Milk, Lbs.	Annual Yield Per Cow. Butter, Lbs.	Per cent. fat in milk.	Specialty of farming.	Cows go dry, Weeks.
13	W. C. Wheatcraft	Greenwood	8	J.	800	4,500	300	.....	Br. for M. & B.	In fall; heifers in spring.
	Iowa.									
14	C. L. Gabrilson	New Hampton	22	J. & S.	1,000	4,200	200	4.9	B.	8.†
15	J. L. Hoyle	Springville	8	J.	800	6,000	305	5.5	B. & Br. for B	4.†
16	Jno. M. Sterr	New Hampton	10	S.	1,000	3,850	155	.....	G. P.	6-8, Jan & Feb.
	Kansas.									
17	H. W. Cheney	North Topeka	25	H.	1,300	.....	.....	3.6	Br. & M.	6-8.†
	Kentucky.									
18	Newton Frazier	Clark's Station	20	J.	900	.....	.....	.....	Br.	50 perct. never dry.†
	Massachusetts.									
19	Geo. L. Clemence	Southbridge	20	Gr.	1,050	5,100	.....	3.9	M. for market	7.
20	F. H. Foster	Andover	10	G. J. Gr.	900	5,500	.....	.....	M for market	6 8.†
21	O. F. Fuller	Blackstone	9	J.	800	5,000	.....	.....	M. & B.	4.†
	Michigan.									
22	O. McVittie	Detroit	9	J.	850	.....	284	.....	B	4 *†
23	M. Nelson	Menominee	32	Gr.	1,100	6,124	.....	.....	M.	6-8.†
	Minnesota.									
24	W. J. Boynton	Rochester	12	H.	1,400	10,000	.....	3.6	Br	4-5.

† All Seasons. * Some not at all.

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25	Ph. Peteler, Supt. North Oaks Stock Farm	righton	40	Gr. S.	1,200	8,500	300	.....	Br.	*.
26	S. W. Wheaton	Caledonia	8	G. S.	1,060	5,060	220	.....	B.	July and Aug.
	Nebraska.									
27	T. G. Ferguson	Stella	30	H.	1,300	.....	.....	5.8	Br. & B	4.†
28	F. H. Vaughan	Fremont	30	J.	1,000	4,050	270	.....	B. & Br.	4, Aug. and Sept.
	New Hampshire.									
29	W. D. Baker	Quincy	12		900	5,500	312	.....	Br. & B	6, July and Aug. *
30	Ch H. Hayes & Sons	Portsmouth	32		1,100	6,000	.....	.....	Br. & M.	8.
	New Jersey.									
31	John Mayer	Mahwah	150	J.	1,000	5,000	350	4.1	M. C. B.	†.
	New York.									
32	Alex. Burns	Bovina	22	J.	800	.....	325	5.4	Br & B.	6.
33	A. S. Cotton, Mgr. Sanatorium Farm	Clifton Springs	106	H., a few A. and Gr. G	1,100	5,650	.....	4.0	M. & B.	4-6.†
34	H. M. Cottrell, Supt. Ellerslie Stock Farm	Rhinecliff	80	G.	1,000	6,120	.....	5.3	Rich M. & gilt edge B.	8.†
35	F. E. Dawley	Syracuse	10	J.	812	.....	306	5.5	B. & Calves	4.†
36	M. C. Denton, Supt. Hillside Stock Farm	Elmira	30	G.	1,050	.....	.....	4.6	Br. & B.	8.†
37	Paul Devereaux	Deposit	60	J.	800	4,534	250	.....	B.	4-8, July & Aug.
38	John P. Douglass	Theresa	70	Gr. H.	1,100	5,043	.....	3.6	M.	4-6, Fall.
39	Frank Eno	Pine Plains	60	J.	1,000	4,800	.....	.....	M. & Br.	6-8, July & Aug.
40	H. S Matteson	Morris	14	J. Gr. J.	900	.....	240	.....	Br. & B.	6, Feb. & Mch.
41	————	Bovina Center	10	J.	850	.....	275	.....	B.	8-12, Winter.
42	D. A. Oliver	Bovina Center	38	J.	900	.....	275	4.0	B.	8, Dec. & Jan.

‡ Jersey-Holstein crossbreds; thoroughbreds on both sides. † All seasons. * Some not at all.

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American Farmers Furnishing Ration for Dairy Cows, 1892–3.—*Continued.*

No.	Name.	Post Office.	No. of cows giving milk.	Breed.	Av weight of cows. Lbs.	Annual Yield Per Cow. Milk. Lbs.	Annual Yield Per Cow. Butter. Lbs.	Per cent. fat in milk.	Specialty of farming.	Cows go dry, Weeks.
43	C. G. Peters	East Williston	5	J.	725	.....	.....	.....	B.	*
44	J. E. Rogers	Binghampton	60	N.	1,000	6,538	.....	4.2	M.	8, June & Jul
45	Geo. W. Sisson	Potsdam	29	J.	800	5,000	300	5.2	Br. M. & B.	2-4. † *
46	Smiths & Powell Co.	Syracuse	60	H.	1,200	12,000	.....	.....	Br. &. B.	0-6. †
47	Dixon Thompson	Bovina Center	33	Gr. J.	800	.....	295	.....	B.	4-8, Jan. & Feb.
48	J. Van Wagenen	Lawyersville	28	N. & Gr. J.	1,100	.....	260	5.2	B.	2-8. †
49	Menzo Wilcox	Milford	9	D. & N.	785	9,200	373	.....	B.	4, Jan. & Feb. *
50	A. Doncourt, Mgr. The Old Brick Farm	Roslyn	30	G.	1,000	7,300	427	5.7	Br.	* †
51	D. P. Witter	Richford	19	Gr. H.	1,100	7,423	.....	.....	M. & Beef	3-6, in Autumn.
	North Carolina.									
52	E. B. C. Hambley	Rockwell	25	J.	800	6,000	330	.....	Choice B.	1. †
	North Dakota.									
53	W. O. Ward	Bismarck	58	J. H. N.	1,100	.....	.....	.....	M.	10. †
	Ohio.									
54	Chr. Hintz	Fremont	11	S.	1,500	.....	.....	.....	Beef, M. & B.	4-6. † e..cept July & Aug.
	Ohio.									
55	John Gould	Aurora Sta.	12	Gr. & N.	1,000	5,900	.....	4.2	M.	8-10, in summer.
56	J. McLain Smith	Dayton	12	R. P.	1,250	6,000	.....	4.3	B.	3-6. †

† All seasons. * Some not at all.

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57	B. B. Overmeyer	Lindsey	9	S.	1,125	4,750	165	4.2	Beef, M. & B.	8.†
58	Henry Talcott	Jefferson	20	Gr. G.	1,200	5,000	250	.....	Br. & B.	4-6, Aug.
	Pennsylvania.									
59	E. E. Critchfield	Mt. Pleasant	20	H. S.	1,160	7,000	.....	3.68	M.	4-8.†
60	Geo. Fox	Torresdale	13	J.	950	.....	.....	.....	M. & B.	8.†
61	John C. McClintock	Meadville	24	J.	900	5,565	370	.....	Gilt-edge B.	3-6.†
62	Ezra Michener	Carversville	15	G.	950	6,200	325	5.0	Br. & B.	4.†*
63	Miller & Sibley	Franklin	40	J. & S.	925	.....	.....	.....	Br. & B.	6-8.†
64	J. B. Phelps	Conneautville	21	All kinds	900	6,000	.....	3.75	M. & B.	3-6.
65	E. Reeder	New Hope	15	J.	800	3,000	200	6.0	B	2 †
66	J. L. Stone	Waverley	20	J.-H.	1,000	6,000	.....	3.8	Br. & M.	4-8, July & Aug.
67	A. P. Young	Millville	9	J.	950	.....	.....	5.12	C. & calves	Come in Aug.-Sept.*
	Texas.									
68	Harwood & Le Baron Bros.	Prairie Lea	45	J.	850	5,250	336	5.7	B. & Br.	4-6.†
	Utah.									
69	H. J. Faust, Jr., Supt. Netherland Fine Stock & D. Co.	Lehi	96	H. Gr. S.	1,200	6,500	.....	3.5	M.	4-6.†
	Vermont.									
70	T. G. Fr nson	East Hardwick	25	J.	800	.....	300	.....	B. & Br.	8.†
71	L S. I ev	Burlington	25	A.	1,000	5,540	.....	4.3	B. & Br.	8.
72	L. C. Fis or	Cabot	27	J.	900	.....	404	.....	B.	6-8, in summer.
73	H. W. Vail	North Pomfret	20	J.	700	.....	285	5.1	B. & Br.	6-8, July and Aug.
74	C. M. Winslow	Brandon	30	A.	1,000	6,167	.....	4.25	Br. & M.	0-8.†
	West Virginia.									
75	R. K. Giffin	Wheeling	42	J.	800	5,780	405	5.9	M. & B.	2-6, summer & fall.

† All seasons. * Some not at all.

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American Farmers Furnishing Rations for Dairy Cows, 1892-93—Continued.

No.	Name.	Post Office.	No. of cows giving milk	Breed.	Av. weight of cows, Lbs.	Annual Yield Per Cow.		Per cent. fat in milk.	Specialty of farming.	Cows go dry, Weeks.
						Milk. Lbs.	Butter. Lbs.			
	Washington.									
76	Brown Bros	Spokane	120	Gr.S J.H.N	1,200	.....	.....	.....	M. & beef	*
	Wisconsin.									
77	C. R. Bridgman	Lamont	23	Gr.S H.G.	1,200	5,000	.....	4.7	B.	†
78	C. H. Everett	Beloit	14	J. G.	900	6,000	300	4.9	B.	July-Aug.
79	C. P. Goodrich	Fort Atkinson	27	Gr. J.	900	5,500	320	5.25	B.	6-8, July-Aug.
80	H. D. Griswold	West Salem	9	Gr. S. G.	1,000	7,052	304	4.75	B	4-5, July-Sept.
81	S. E. Guernon	Waukesha	30	Gr. J.	800	5,000	332	5.8	B.	4-6.†
82	Geo. Hodgson	Pewaukee	19	J. G.	800	6,270	308	4.5	B.	6.†
83	John Hodgson, Jr.	Pewaukee	21	J. Gr. G.	1,000	5,225	200	.....	C.	† except June-July.
84	R. S. Houston	Ranney	45	J. G.	825	6,235	.....	.....	M.	6.†
85	A. X. Hyatt	Sheboygan Falls	28	Mostly S.	1,200	8,000	.....	4.1	B. M	7-10, Jan.-March.
86	Chas. Linse	La Crosse	43	Gr. J.	900	.....	280	4.7	B.	†
87	A. F. Noyes	Beaver Dam	20	S.	1,000	.....	.....	.....	Beef, M. B.	8.†
88	C. A. Salisbury	Clinton	11	Gr J. S H.	1,100	6,500	.....	3.8	M.	July-Aug. *
89	C. Thorp	Burnett Jct	13	Gr J N.	1,000	6,000	321	4.8	B.	8, July-Aug.
90	M. Tourtellotte	La Crosse	20	H. N.	1,000	.....	.....	.....	B.	8-16.*
91	Widman Bros	Fort Atkinson	24	N. Gr. S. H.	1,150	7,456	325	3.9	B.	4-6, Aug.-Sept.*

* Some not at all. † All seasons.

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	Canada.									
92	Herman Bollert	Cassel	10	H.	1,300	10,000	.....	4.0	Br & M.	4-6.†
93	D. McPherson	Lancaster	60	N.	900	5,000	.....	4.0	Br. & M.	4-8.
94	John Pringle	Ayr	10	H.	1,150	.....	286	.....	Br. & B.	6.*
95	R. Reesor	Locust Hill	25	J.	1,000	.....	.....	.....	C.	1-2.†
96	A. & G. Rice	Curries	25	H.	1,200	9,000	.....	3.9	Br. & M.	8, Feb.-March.
97	Smith Bros	Churchville	34	H.	1,200	10,000	.....	3.84	Br. for M. & B	4-6, Aug.-Sept.
98	J. Yuill & Son	Carleton Place	22	A.	900	.....	.....	.....	Br. & B.	8, Sept. -Oct.*
99	J. E. Page & Sons	Amherst, N. S.	22	HJGrHJS	1,200	7,500	.....	.....	Br. & M.	6.†
100	R. Robertson	Howick, Que	23	A.	1,000	8,000	360	4.0	M. & Br.	8, Sept.-Nov.

*Some not at all. † All seasons.

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AMERICAN RATIONS FOR DAIRY COWS.

The following are the rations furnished by the farmers whose names are given in the preceding table, the numbers corresponding to those in the above table. As before stated, the weights in many cases have no claim to absolute accuracy; from the nature of the problem it would usually be extremely difficult to ascertain the exact average quantities of the different feed stuffs eaten by cows in the various herds. It would involve separating the cows in milk from the dry cows, calves and other stock, and determining the actual quantities of each feed eaten daily by the former group. In some cases, especially the coarse fodder may have been somewhat over estimated, in other cases average feeds were actually weighed; taken all through, however, it is believed that the rations given correspond fairly well with the food actually consumed daily by the cows in each herd and that they may safely be made the basis of discussions of the distinctive systems of feeding practiced by the various dairymen and breeders.

100 *American Rations for Dairy Cows.*

Colorado.

1.—30 lbs. corn silage, 10 lbs. alfalfa hay, 10 lbs. clover hay, 5 lbs. roller bran, 2 lbs corn meal.

2.—20 lbs. alfalfa hay, 10 lbs. corn fodder, 3 lbs. cotton seed meal, 4 lbs. corn meal, 13 lbs. bran, 35 lbs mangolds,

3.—20 lbs. alfalfa hay, 5 lbs. oat straw, 2½ lbs wheat bran, 2½ lbs. shorts, 5 lbs. oats, 1½ lbs. cotton seed meal.

4.—40 lbs. corn silage, 15 lbs. alfalfa hay, 4 lbs. bran, 4 lbs. corn chop.

Connecticut.

5.—35 lbs. corn silage, 10 lbs. hay, 3 lbs. bran, 3 lbs. corn and cob meal, 2 lbs. cotton seed meal, 2 lbs. Chicago gluten meal.

Illinois.

6.—7½ lbs. clover hay, 7½ lbs. timothy hay, 12 lbs. corn and cob meal, 8 lbs. bran, 1½ lbs. linseed meal, 1½ lbs. cotton seed meal.

7.—15 lbs. corn stalks, 4 lbs. of hay, 3½ lbs. hominy meal, 3½ lbs. shorts, 3½ lbs. wheat bran, 3½ lbs. buckwheat bran.

8.—50 lbs. of corn silage, 4 lbs. wheat shorts, 4 lbs grano gluten.

9.—40 lbs. corn silage, 8 lbs. timothy hay, 4 lbs. bran, 2 lbs. corn meal, 1 lb. oats.

10.—10 lbs. timothy hay, 10 lbs. clover hay, 8 lbs. corn, 1½ lbs. oats.

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Indiana.

11.—30 lbs. corn silage, 5 lbs. clover hay, 3 lbs. corn fodder, 1 lb. oat, straw, 1 lb. wheat straw, 5 lbs. bran, 2 lbs. oil meal, 2 lbs. cotton seed meal.

12.—6 lbs. corn fodder, 12 lbs. clover hay, 4 lbs. wheat bran, 4 lbs. hominy meal, 1 lb. linseed meal.

13.—24 lbs. corn fodder, 5 lbs. corn meal, 3½ lbs. bran, 1½ lbs. oil meal, ½ lb. cotton seed meal.

Iowa.

14.—50 lbs. corn silage, 5 lbs. hay, 5 lbs. corn fodder, 1 lb. oat straw, 1 lb. barley straw, 5 lbs. ear corn, 2½ lbs. ground oats and barley.

15.—40 lbs. corn silage, 5 lbs. timothy and clover hay, 7 lbs bran or shorts.

16.—20 to 25 lbs. clover hay, 12.7 lbs. corn, 4.9 lbs. oats..

Kansas.

17.—50 lbs. sorghum fodder; 7½ lbs. of hay, 3.2 lbs. of bran, 3.2 lbs. of corn meal, 1½ lbs. oil meal.

Kentucky.

18.—32.5 lbs. corn silage, 6 lbs. clover hay, 3 lbs. corn fodder, 5 lbs. corn meal, 4 lbs. ship stuff, 2 lbs. oil meal.

Massachusetts.

19.—40 lbs. corn silage, 5 lbs. English hay, 5 lbs. clover hay, 2 lbs. bran, 2 lbs. gluten meal, 1 lb. cotton seed meal, 1 lb. linseed meal.

20.—40 lbs. corn silage, 6 lbs. hay, 2 lbs. gluten meal, 2 lbs. corn and cob meal, 2 lbs. shorts.

21.—12 lbs. timothy hay, 10 lbs. rowen, 1.8 lbs. shorts, 2.6 lbs. corn meal, 3 lbs. cotton seed meal.

Michigan.

22.—27.5 lbs. corn silage, 3½ lbs. clover hay, 3½ lbs. timothy hay, 3.6 lbs. bran, ½ lb. oats, 1 lb. rye, ½ lb. linseed meal.

23.—24 lbs. timothy hay, 4 lbs. oat fodder, 4 lbs. rye fodder, 12 lbs. middlings, 5 lbs. dried brewers' grains.

Minnesota.

24.—50 lbs. corn silage, 8 lbs. hay, 3 lbs. bran, 2 lbs. shorts, 3 lbs. ground rye and oats, 2 lbs. barley.

25.—8 lbs. corn fodder, 7 lbs. clover and timothy hay, 5 lbs. sheaf oats, 3 lbs. rutabagas, 2 lbs. bran, 3 lbs. oats, 3 lbs. corn meal, 2 lbs. oil cake.

26.—23 lbs. clover and timothy hay, 10 lbs. ground barley.

Nebraska.

27.—10 lbs. clover hay, 35 lbs. silage, 2 lbs. oat straw, 5 lbs. corn meal, 5 lbs. bran, 5 lbs. oats.

28.—20 lbs. prairie hay, 10 lbs. corn fodder, 5.7 lbs. corn meal, 2.9 lbs. bran, 1.4 lbs. oil meal.

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New Hampshire.

29a.—10 lbs. clover and witch grass hay, 10 lbs. corn stover, 5 lbs. unthrashed barley, 2 lbs. corn and cob meal, 2 lbs. shorts, 2 lbs. cotton seed meal.

29b.—11.7 lbs. clover and witch grass hay; 3.3 lbs. oat straw, 10 lbs. meadow hay, 2 lbs. shorts, 2 lbs. corn and cob meal, 1 lb. ground pease, 1 lb. oats, 1 lb. barley.

29c.—10 lbs. meadow hay, 10 lbs. corn stover, 5 lbs. pea straw, 2 lbs. middlings 1½ lbs. gluten meal, 1½ lbs. cotton seed meal, 2 lbs. corn and cob meal.

29d.—10 lbs. clover and witch grass hay, 10 lbs. meadow hay, 5 lbs. pea straw, 2 lbs. shorts, 1 lb. gluten meal, 1 lb. cotton seed meal, 2 lbs. corn and cob meal.

30.—35 lbs silage, 7 lbs. hay, 20 lbs. brewers' grains, 1½ lbs. gluten meal, 1½ lbs. cotton seed meal, 1½ lbs. shorts, 1½ lbs. linseed meal.

New Jersey.

31a.—24 lbs. corn silage, 8 lbs. corn meal, 2 lbs. bran, 4 lbs. oats, 2 lbs. oil meal.

31b.—24 lbs corn silage, 4 lbs. corn meal, 2 lbs. bran, 6 lbs. oats, 2 lbs. oil meal.

New York.

32 —20 lbs. hay, 2 lbs. bran, 2 lbs. cotton seed meal, 2 lbs. hominy meal.

33a.—40 lbs corn silage, 10 lbs. corn fodder, 2½ lbs. cotton seed meal, 2 lbs. N. P. linseed meal, 4 lbs. wheat bran.

33b.—35 lbs prickly comfrey, 10 lbs corn fodder, 2½ lbs. cotton seed meal, 2 lbs. N. P. linseed meal, 4 lbs. wheat bran.

34.—25 lbs. corn silage, 7 lbs. mixed hay, 4 lbs. corn meal, 5 lbs. bran, ½ lb. oil meal, ½ lb. cotton seed meal.

35.—40 lbs. corn silage, 15 lbs. hay, 2 lbs. linseed meal, 4 lbs. wheat bran, 2 lbs. corn meal, 2 lbs. oat meal.

36.—40 lbs. corn silage, 10 lbs. timothy hay, 5 lbs wheat bran, 3 lbs. corn meal, 2 lbs. oil meal.

37.—50 lbs. corn silage, 5 lbs. hay, 4 lbs. bran, 2 lbs. linseed meal, 1 lb. cotton seed meal, 1 lb. ground rye.

38.—28 lbs. of hay, 4 lbs. ship stuff.

39.—20 lbs. hay, 2½ lbs. bran, 4½ lbs corn and cob meal.

40.—15 lbs. clover hay, 4 lbs. corn stover, 4 lbs. timothy hay, 1.3 lbs. corn meal, ½ lb. oats, ½ lb. bran, 5.7 lbs. carrots.

41.—40 lbs. corn silage, 15 lbs. hay, 5 lbs. bran, 2 lbs. cotton seed meal, 3 lbs. corn meal.

42.—23 lbs. hay, 4 lbs. bran, 2 lbs. cotton seed meal, 2 lbs. corn meal.

43a.—30 lbs. corn fodder, 2.3 lbs. ground oats, 1.2 lbs. corn meal, .6 lb. bran, .6 lb. oil meal.

43b.—30 lbs. corn fodder, 3 lbs. corn meal, 1.6 lbs. ground oats, .8 lb. bran, .8 lb. linseed meal.

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44.—40 lbs. corn silage, 3 lbs. cotton seed meal, 18 lbs. corn-starch feed.

45.—30 lbs. corn silage, 12 lbs. clover hay, 8 lbs. wheat middlings, 1 lb. oil meal.

46.—40 lbs. corn silage, 15 lbs. hay, 9 lbs. wheat bran, 4½ lbs. germ meal, 1 lb. oats, 1 lb. wheat, 1 lb. barley, 1 lb., corn, ½ lb. linseed meal.

47.—20 lbs. hay, 2½ lbs. cotton seed meal, 2½ lbs. corn meal, 3 lbs. shorts.

48.—9 lbs. clover hay, 9 lbs. timothy hay, 5 lbs. corn fodder, 5 lbs. of oat and pea straw, 1 lb of oats, 1 lb. buckwheat middlings, 1 lb. corn, 1 lb. rye bran, 1 lb. wheat bran, 1.6 lbs. cotton seed meal.

49.—12 lbs. timothy hay, 1 lb. bran, 1 lb. middlings, 2 lbs. corn meal, 2 lbs. cotton seed meal, 40 lbs. skim milk.

50.—42 lbs. corn silage, 2½ lbs clover hay, 2½ lbs. timothy hay, 8 lbs. corn and cob meal, 14 lbs. dried brewers' grains.

51.—35 lbs. corn silage, 4 lbs. clover hay, 4 lbs. timothy hay, 2 lbs. wheat bran, 5 lbs. cotton seed meal.

North Carolina.

52.—30 lbs corn silage, 8 lbs. fodder corn, 3 lbs. corn meal, 3 lbs. bran, 1 lb. cotton seed meal.

North Dakota.

53.—32 lbs. prairie hay, 6 lbs. bran.

Ohio.

54.—25 lbs. clover hay, 34 lbs mangolds, 3 lbs. corn and cob meal, 1½ lbs. oats, 2 lbs. wheat bran.

55.—50 lbs. corn silage, 8 lbs. clover hay, 5 lbs. "seconds".

56.—30 lbs. corn silage, 8 lbs. corn stover, 5 lbs. bran, 4 lbs. malt sprouts, 1 lb. oil meal.

57.—10 lbs. clover hay, 20 lbs. corn stalks, 8 lbs. corn meal, 3 lbs. corn and cob meal, 1 lb. bran, 8 lbs. roots.

58.—50 lbs. corn silage, 9 lbs. clover hay.

Pennsylvania.

59.—45 lbs. corn silage, 7 lbs. mixed hay, 6 lbs. bran, 2 lbs. cotton seed meal.

60.—10 lbs. clover hay, 5 lbs. timothy hay, 2½ lbs corn fodder, 6½ lbs. corn meal, 2 lbs. oats, 3.2 lbs. bran, 1⅓ lbs. oil meal, 15 lbs. carrots.

61.—24 lbs. corn fodder, 5.1 lb. bran, 5.1 lbs corn meal, .3 lbs. cotton seed meal, 2 lbs. oil meal.

62.—10 lbs. corn fodder, 6 lbs. hay, 3½ lbs. bran, 1½ lbs. cotton seed meal, 1½ lbs. oil meal, 2½ lbs. corn meal.

63.—15 lbs. corn silage, 22 lbs. sugar beets, 10 lbs. hay, 5.4 lbs. oats, 7 lbs. corn meal.

64.—40 lbs corn silage, 8 lbs. clover hay, 6 lbs. coarse linseed meal.

65.—10 lbs. hay, 5 lbs. corn fodder, 6 lbs. corn meal, 3 lbs. wheat bran.

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66.—40 lbs corn silage, 10 lbs. mixed hay, 4 lbs. corn meal, 4 lbs. wheat bran, 2 lbs. cotton seed meal.

67.—40 lbs. corn silage, 7 lbs. hay, 1 lb. straw, 2 lbs. oil meal, 2 lbs. corn and cob meal, 2 lbs. wheat bran.

Texas.

68.—30 lbs. corn silage, 13½ lbs. sorghum hay, 1.3 lbs. corn meal, 2.6 lbs. cotton seed meal, 2.2 lbs. cotton seed, 1.3 lbs. wheat bran.

Utah.

69.—35 lbs. alfalfa hay, 6¾ lbs. wheat bran, 3½ lbs. barley.

Vermont.

70.—35 lbs. corn silage, 10 lbs. mixed hay, 2 lbs. bran, 3.2 lbs. corn meal, 1 lb. linseed meal, .8 lb. cotton seed meal.

71.—20 lbs. corn silage, 14 lbs. hay, 3 lbs. bran, 2 lbs. gluten meal.

72.—30 lbs. corn silage, 10 lbs. hay, 4.2 lbs. corn meal, 4.2 lbs. bran, .8 lb. linseed meal.

73.—30 lbs. corn silage, 10 lbs. hay, 2 lbs. corn meal, 2 lbs. gluten meal, 2 lbs. bran.

74.—30 lbs. hay, 1.8 lbs. wheat bran, .9 lb. wheat middlings.

West Virginia.

75.—48 lbs. corn silage, 2½ lbs. corn and cob meal, 2½ lbs. ground wheat 2½ lbs. oats, 2½ lbs. barley meal.

Washington.

76.—15 lbs. alfalfa hay, 7 lbs. bran, 7 lbs. shorts, 2 lbs. malt sprouts.

Wisconsin.

77.—30 lbs. corn silage, 8 lbs. hay, 5 lbs. corn fodder, 4 lbs. oats, 2 lbs. pea meal.

78.—40 lbs. corn silage, 8 lbs. clover hay, 6 lbs. bran, 2 lbs. pea meal.

79.—32 lbs. corn silage, 5 lbs. clover hay, 5 lbs. corn stalks, 8 lbs. bran, 2 lbs. cotton seed meal, 2 lbs. oat straw.

80.—12 lbs. timothy hay, 5½ lbs. corn fodder, 6 lbs. corn meal, 2 lbs. oats, 2 lbs. barley, 5 lbs. bran, 7½ lbs. potatoes.

81.—26 lbs. corn silage, 10 lbs. clover hay, 5 lbs. timothy hay, 8 lbs. wheat middlings, 1½ lbs. oil meal.

82.—25 lbs. uncut corn silage, 10 lbs. clover hay, 9 lbs. bran.

83.—40 lbs. corn silage, 5 lbs. clover hay, 5 lbs. timothy hay, 4½ lbs. bran, 4½ lbs. middlings.

84.—45 lbs. corn silage, 12 lbs. clover hay, 8 lbs. shorts, 4 lbs. corn meal.

85.—25 lbs. roots, 8 lbs. oat meal, 3 lbs. oil meal, 15 lbs. hay, 10 lbs. corn fodder, 4 lbs oat straw.

86.—22 lbs. corn silage, 4 lbs. clover hay, 4 lbs. timothy hay, 2 lbs. oat straw, 2 lbs. corn stalks, 6 lbs. wheat screenings, 2 lbs. malt sprouts, 2 lbs. oil meal, 1 lb. wheat bran.

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87.—24 lbs. corn silage, 15 lbs. corn fodder, 5 lbs. clover hay, 5 lbs. bran.

88.—19 lbs. corn fodder, 9 lbs. clover hay, 1 lb. barley straw, 4 lbs. corn meal, 3 lbs. barley meal, 3 lbs. bran.

89.—40 lbs. corn silage, 10 lbs. fodder corn, 2 lbs. corn stalks, 2 lbs. oat straw, 5 lbs. ground oats, 5 lbs. barley.

90.—17 lbs. corn silage, 17 lbs. timothy hay, 1.7 lbs. corn stalks, 2 lbs. oat straw, 1.7 lbs. oil meal, 2.7 lbs. oats, 1.7 lbs. bran.

91.—50 lbs. corn silage, 5 lbs. sheaf oats, 5 lbs. corn fodder, 1 lb. clover hay, 1 lb. millet, 2.7 lbs. cotton seed meal, 1.3 lbs. of oil meal, 6 lbs. bran.

Canada.

92.—40 lbs. corn silage, 5 lbs. hay, 5 lbs. straw, 4½ lbs. bran, 4½ lbs. oats.

93.—45 lbs. corn silage, 5 lbs. hay, 5 lbs. bran, 3 lbs. cotton seed meal.

94.—45 lbs. turnips, 7 lbs. of wheat chaff, 15 lbs. silage, 2½ lbs. oats, 2½ lbs. pea meal.

95.—30 lbs. corn silage, 12 lbs. hay, 10 lbs. ground oats.

96.—40 lbs. corn silage, 30 lbs. turnips, 8 lbs. clover hay, ½ lb. straw, 2 lbs. oats, 2 lbs. wheat bran.

97.—50 lbs. corn silage, 10 lbs. clover hay, 3 lbs. straw, 5 lbs. pea meal, 2 lbs. oats.

98.—30 lbs. corn silage, 7½ lbs. hay, 6½ lbs. straw, 25 lbs. turnips, 1.3 lbs. pea meal, 2.5 lbs. oats, 1.3 lbs. barley.

99.—35 lbs. corn silage, 8 lbs. English hay, 30 lbs. carrots, 1.2 lbs. bran, 1.8 lbs middlings, 3 lbs. cotton seed meal, 1 lb. oat, 2 lbs wheat.

100.—40 lbs. corn silage, 7½ lbs. clover hay, 3 lbs. straw, 1½ lbs. oats, 1½ lbs. barley, 1½ lbs. pea meal, 3 lbs. wheat bran, 1 lb. cotton seed meal.

EXTRACTS FROM CORRESPONDENCE.

In the following extracts from the letters received, the effort has been first of all to include statements explaining special points in regard to the rations given in the preceding pages; opinions of the farmers as to the feeding value of certain cattle foods and their preferences, and information in regard to their system of feeding and management of cattle are further given, and finally, any data that were considered of value in shedding light upon the agricultural conditions and resources of our country. To this last end, current market prices of cattle foods have been included when given, and also as far as practicable, the conditions of growing and harvesting crops in the various regions.

The writer is of the opinion that the extracts given below will be read with profit by all farmers, whether dairymen or not; the views of hundred dairymen who have made a success of their business and who are among our most enlightened and experienced farmers, will prove of vits

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interest to the student of dairy husbandry and will present to him in a condensed form the results of many years of hard work and study, practical experiences so varied and, as a rule, so well grounded, as it seldom falls to any one man's lot to ascertain within a short time.

The writer does not vouch for the correctness of all statements made in the extracts; the reader must judge for himself of the evidence back of each one of them. The trend of opinions on any single subject may, however, be easily discovered. For instance, wheat bran and flour mill refuse feeds are condemned as food for milch cows by one farmer; an examination of the rations fed shows, however, that seventy-three of the number given contain the former feed, and ninety six rations contain bran, shorts, middlings and similar feed as component parts.

EXTRACTS FROM CORRESPONDENCE.

Colorado.

1.—The milk of each cow is weighed three times every month, and tested at the same time by the Babcock test, and a record kept of each cow.

I have never weighed the hay, and do not know the weight, but think about 20 pounds. I have plenty of hay, and so give all I can get them to eat. The clover is pure clover without any timothy or weeds, and same with the alfalfa. The clover was cut while in full blossom, but was very rank and a little too coarse to be first-class. I cut three crops of clover annually during the last two years from the same land, and the same with alfalfa. I only fed four, and sometimes six pounds of bran per cow, with about two pounds corn meal per day; one half in the morning and the other at night. My grain ration is not so large as you Wisconsin people feed, and perhaps my cows would do better on more, but the price has something to do with it. Clover hay or alfalfa can be bought for $4 per ton, while bran is worth $16, and corn meal about the same. Our bran is roller process, with shorts and nearly all the low grade flour run into it. I have no pasture, and feed in the stable every day in the year. Feed the same grain ration all the time. My ensilage was well eared and matured enough to shock at the time I put it into the silo. From June 1st to November, I feed alfalfa fresh cut without curing.

2.—The current market prices for feed are: Alfalfa hay, $7; beets, $3; cotton seed meal, $23; corn chop, $16; bran, $16, and fodder $3.

Our standard for cows is 10,000 pounds of milk per year; hope to make it in 1893.

3.—The alfalfa, as a rule, was third cutting, put up quite green.

4.—The average price of alfalfa is about $4 per ton, in stock.

Have fed barley chop with bran; would prefer it to corn chop at same price. Have fed mangolds, but prefer silage.

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Connecticut.

5. *Memoranda from Spring Hill Farm, Rockville, Conn.*

	1888.	1889.	1890.	1891.	1892.
Cows milked, av'ge number.....	20	18	17	19	24
Butter sold during year, lbs.....	6,512	6,573	5,974	6,040	*8,900
Total amount received from butter sales.	$2,031 61	$2,007 20	$1,747 80	$2,059 10	.....
Butter per cow, average number of lbs.....	325½	365	351½	355½	375
Av'g amount received per cow..	$101 58	$111 50	$102 81	$121 12	.....

* Cream sold—butter equivalent.

Illinois.

6.—I generally feed ground oats, but failed to raise any last year on account of the wet spring.

I breed my cows to have them calve every month in the year as near as I can, so as to have fresh cows' milk to mix with that of strippers. The Brown-Swiss cows milk up to calving; I never saw any bad results from milking right up to calving.

8.—Three-fourths of my dairy was, at the time of these figures, four-year-olds and under. They are larger now and older, and are testing higher. For December, my average test was 4.20 per cent. of fat in the milk and 4.87 per cent. of butter, or 13 per cent. more butter than fat.

Indiana.

11.—Hay, straw and fodder are cut in ¼ inch lengths by power cutter, moistened with boiling water, ground feed is mixed with it, covered tightly in chest and allowed to stand 12 hours before being fed. I give twice a day what each cow will eat up clean.

A small pinch of salt goes in every mess of grain food given, while a lump of rock salt lies in every feed box. Too many owners think that salting once a week or twice a month is sufficient. Not only is it an appetizer, but a corrective for many stomach disorders in cattle, as well as a preventive agent in the same.

Three weeks before my cows are due to calve, I omit all grain feed except bran, and feed only about one gallon of that a day, with timothy hay, no clover, and twice a week give a peck of apples or raw potatoes, or sliced pumpkins, being extremely careful to remove every seed from the pumpkin.

In addition to the precaution of feeding a strengthening and non-milk producing ration of dry timothy hay, I feed in each mess of dry bran one teaspoonful of pulverized assafoetida; I find that the best sedative I have

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ever used, and with a nervous cow much depends upon her being kept as quiet as possible when near parturition.

12.—Grain well mixed, salted, dampened to a thick mush and placed with coarse feed in each cow's feed box.

13.—Our cows would easily eat one pound of cotton seed meal and perhaps more, but we would not feed more than half a pound; in fact, I am not much in favor of feeding it at all, as its effects on the cows are extremely pernicious.

Iowa.

14.—The quantities of milk and butter are not as large as they should be, for the reason that the number of cows reported is the actual number without any deduction for young heifers, such as is often made. Our herd includes a large number of Jersey heifers under four years of age.

15.—The milk is creamed by gravity process in water at 58°.

16 —This being a cold climate, we do not believe in feeding for milk alone, making the cows poor, so that they could not stand the cold weather well.

Kansas.

17.—I have kept no yearly record, but test each cow when fresh and if she will not give 50 lbs. daily on dry feed, or 60 lbs. on grass and grain, I do not keep her long. I test again about eight months after calving and want her to be giving a good mess then, and to milk the year through without going dry, if necessary.

Our main feed in this section for dairy cows is wheat bran, which now costs us $10 per ton. How to avoid the purchasing of so much of it by substituting something that can be raised on the farm, is a problem which I have tried in various ways to solve, with but feeble results. I use a great deal of oil meal, but with bran at $10 per ton and oil meal at $28, as I have considered the latter too high, and hence have fed less this year than common.

I raise large quantities of sorghum for coarse feed; I plant on plowed ground about June 1st, with a two-horse corn planter, dropping hills one foot apart in row. This I cultivate in the same way as corn; it grows 10 to 16 feet high with as many as 60 stalks in a hill. I let it get dry and cut and shock same as corn. I also use it for soiling as soon as pastures commence to fail in the fall. I commence cutting and hauling, scattering in the pasture; this makes a splendid feed, but I am not sure but there is too much sugar in it for the health of the animals, if fed constantly.

Kentucky.

18.—I am aiming to breed a herd of thirty-five cows that will, in good breeding condition, make a pound of butter for every day in the year.

I think a better butter ration would be 6 to 7 pounds of corn meal, 4 lbs. of ground oats and 2 pounds of oil meal.

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Massachusetts.

21.—I think no farmer can make milk or butter in the winter without ensilage, and make a profit.

Michigan.

23.—I used to feed one half bran and one half middlings; now I feed all middlings, as I find I get more and better milk.

For a description of methods of feeding and management of farm, see *Hoard's Dairyman*, Dec. 23, 1892.

Minnesota.

25.—40 Grade Shorthorns, 195 head in all in the herd (Shorthorns, Polled Angus). I find that it requires from Grade Shorthorn cows for the whole year about 27 to 28 lbs. of milk to one pound of butter.

Nebraska.

28.—As near as I can calculate it, the cows ate in the vicinity of 20 lbs. of prairie hay and 10 lbs. of corn fodder per day. In this country of cheap feed we pay but very little attention to the amount of coarse fodder an animal consumes, but always give them all they will eat, and consider able to waste.

I have fed the ration given for the past two winters with very good results, and think I would prefer corn silage to the dry corn fodder.

New Hampshire.

29.—We have to feed at the barn about seven months of the year and I therefore aim to give my cows as much of a variety of food as I can, for I think they need a change of rations as much as I do; I send you four which have been fed in our dairy. I feed no silage, as all our butter goes to private customers who, for some reason, object to "ensilage butter," and as they pay a fancy price, I try to give them just what they want. Our butter has been awarded first premiums five years in succession at the annual exhibit of our State Dairymen's Association.

I found that the gluten was not improving the *quality*, although slightly increasing the *quantity* of the butter; the flavor scored 49 out of a possible 50 at our exhibit last month. I feed a few potatoes (small), say 2 qts. once in about ten days, and a tablespoonful of bean meal once a week as a preventive of garget; this proves entirely satisfactory.

30.—The demand for brewers' grains is such that we cannot always get a supply; we double the quantity of grain and the results are the same. We can make as much milk from the grain feed as from the brewers' grains, but the cost is enhanced. While we feed liberally, we do not overfeed, as we have a breeding herd.

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New Jersey.

31.—Four hundred head on farm, all ages.

We consider the ration given the best feed, which costs with straw for bedding and labor, 25 cents per cow.

We raise all our own heifers to increase the production of milk, cream and butter.

New York.

33.—We feed prickly comfrey from May 15th to Sept. 1st, about 35 lbs. each day (usually a noon meal).

34.—The problem we have in our dairy is this: Our customers demand sweet cream butter; it must be very hard, of good grain and rich flavored. Under the same methods of feeding we find sweet cream butter considerably softer than that from ripened cream. We can make the best quality of butter when our grain ration is one-half corn meal, but on such a ration our cows do not produce enough, and have a tendency to run to fat. I have tried to increase the albuminoids by increasing the amount of cotton seed meal, but invariably have found the quality of the butter injured. If we feed more than 1 lb. per day of cotton seed meal, the butter is waxy. If more than 1 lb. of linseed meal, the butter is oily and has a slightly disagreeable flavor. The trouble with most of the rations recommended, is that they are designed for increasing the quantity of milk without much regard to quality of butter.

We think we get best results from equal parts, by weight, of bran, corn meal, and ground oats with cotton seed and linseed meals mixed as given. This winter the price of oats is too high to be considered economically.

38.—We are very punctual in feeding, which we consider an important factor in dairying. Our stable is *very warm* and *well* ventilated.

During November and December a good foddering of oats in the straw is fed once a day, and three good fodderings of hay, 20 pounds at least, three times a day.

The ration given is our usual winter ration, but during March and April we *cut* the hay, dampen it, stirring in the usual ration of ship stuff. This is a change which the cattle relish very much.

We feed during July, August, September and October, one good foddering of hay, oats or corn each day, at night in the stable.

39.—I am aware that we could increase our milk product by feeding heavier, but am convinced by long experience, that with the price of milk any heavier feeding would be a loss of profit. The New York market averages about 2 cents per quart for six months, and about 3 cents for six months. If we should feed as much grain as some dairymen do who report to you, we should run in debt.

41.—Does not want his name published.

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44.—Leaming corn silage about 40 pounds per day. Corn for silage grown by planting eight to ten quarts of seed per acre, standing until nearly mature before cutting.

We do not pasture our cows, but feed from the silo the year round.

45.—Cost of ration *to me*, 16 cents per day.

This has been my standard ration for three winters, except that I have used different kinds of corn for silage, and this winter's silage is the best yet made. I do not always have clover hay enough, and notice a falling off in product when a change is made to timothy and meadow hay.

46.—We have usually fed one-third each of wheat, bran, fine corn meal and oat meal mixed, by weight.

The average yield per cow per year, for our herd, is put at 12,000 pounds although it has been much above this amount for several years.

One year our mature cows averaged over 17,000 lbs. and our entire herd of two-year-olds, — over thirty head, — over 12,400 lbs.

47.—No grain fed in June; from July to January, 9 lbs. corn meal, 1 lb. shorts per day. To dry cows, 2 lbs. shorts are fed daily, and hay twice a day, what they will eat up clean.

48.—Every cow on the place has been bought of the farmers around here. Find some old style Short-horns very satisfactory. Average butter yield last year was 260 lbs. Will do better next year, as we are using the Babcock milk test now, and acting accordingly. The German experimenters to the contrary, I find that feed does change amount of fat in milk; much richer on stable feeding than on grass. Also I can make as much in stable on my light ration as on pasture. My grain ration changes almost every time I feed a fresh lot. Formerly fed heavier grain ration, but have concluded we fed beyond profit line. Cows were frequently "off feed". Grain is fed on cut feed, and moistened. Try to feed according to the cow, — not the same to each. Cows are out long enough to drink twice a day at a full trough in barn yard. They eat corn fodder up clean. Am not very certain that I want any silo. Have just started to breed up a herd from a Holstein bull.

I give you local prices of feed stuffs now: Cotton seed meal, $30 per ton; buckwheat middlings, $16 per ton; rye bran, $17 per ton; wheat bran $19 to $20 per ton; oats, 45 c. per bu. ($28.13 per ton.)

49.—After "coming in" in March and April, six lbs. per day of bran and middlings, corn meal and cotton seed meal, equal parts by weight, are fed on top of 40 lbs. skim milk and butter milk; when grass comes the meal is reduced, but a little is fed the whole year, unless the cows are dry, and in high flesh; then none is fed.

Feed ripe apples for a time in fall of year, not to exceed 6 qts. each cow per day.

I would put one part of oat meal in the ration, if not worth over 35 cents per bushel.

For further information in regard to the very peculiar system of feed-

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ing practiced by Mr. Wilcox, see *Hoard's Dairyman* for May 19, June 23, September 29 and October 6, 1893.

50.—As our farm is adapted to raising market stuff, such as cabbage, potatoes, turnips, etc., we send market loads several times a week in winter and fall to the New York market. We have the trimmings of cabbage, small turnips, potatoes, etc , which are available in no other way but to be used on the farm. These we find make a most excellent and appetizing food in the rations of cows and pigs.

The ration given is sometimes varied by feeding cut corn stalks instead of hay, or bran instead of dry brewers' grains, and sometimes linseed meal is added at the rate of one pint per cow. This latter we consider a valuable feed and an addition to the ration, but at $32 a ton and bran at $21, we find the former ration quite as good and more profitable, claiming that the cabbage and turnips has the same beneficial effect on their health and corresponding results in the dairy.

Our butter is all engaged at 50 cents a pound, winter and summer.

I will mention also that we consider ground barley cooked to a pudding and mixed with the skim milk one of the finest rations for calves; occasionally we use also one part of corn meal to ten of barley, and again one of rye and one of corn to ten of barley.

North Carolina.

51.—I think next year I shall feed silage morning and evening with grain, and clover hay and cured cow pea vines at noon, feeding ten pounds only of silage at each meal.

I propose keeping 200 head ot milkers, all A. J. C. C. Jerseys, and in the course of a year or two will collect data of their performance that may be of use to you.

North Dakota.

53.—Our hay is upland prairie, and rated to be worth more per ton to feed than timothy hay such as we feed in southern Minnesota. Oat straw was fed once a week just for change of feed.

The ration is our usual feed for the winter, improved by feeding roots occasionally.

Ohio.

54.—I consider the Short horn the best for beef, milk, butter or general purpose breed.

55.—"Seconds" are here known the grade of fine bran, that shows quite an amount of flour in them, though I dare say that they are largely bran reground and possibly a little flour dust of some kind mixed in. They are bought here by the milk men in preference to any other grain for cows, and at present sell in car load lots in Cleveland at $14 per ton.

I think corn and cob meal in part would better the ration given.

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56.—It is our regular winter ration, except when the corn stover gives out we feed clover hay in lieu of it. A little more oil meal might be an improvement.

Three of the cows were officially tested by the Ohio Experiment Station last winter as follows:—Coronet, fresh November 1, 1891, tested December 17, '91, gave for 24 hours 37.02 lbs. of milk in two milkings, containing by analysis, 12.5 per cent. total solids, 3.82 per cent. fat. Total fat, 1.41 lbs. Linda, fresh December 6, '91, tested December 31, '91, gave 42.07 lbs. milk; solids 12.33 per cent., fat 3.51 per cent. Total fat, 1.49 lbs. Lady of Tillerhall, fresh August 8, '91, tested December 17, '91, gave 33.06 lbs. milk; solids 14.2 per cent., fat 4.74 per cent. Total fat, 1.58 lbs.

The gross receipts from herd last year, January 1, 1892, to January 1, '93, as taken from my books, were as follows:—12 cows and heifers: cream sold, $632; butter, $59,96; stock (including 4 heifers over two years old, the balance calves), $1,490. Total, $2,181.96.

57.—In summer our cows run in pasture and get 2 qts. corn and cob meal night and morning before milking.

58.—Silage from fairly matured corn, siloed "ears and all," about 50 lbs. per day per head has been fed, and 8 to 10 lbs. clover hay. I have not fed a pound of dry feed to my cattle in five years. For over twenty years I kept a large dairy, fed dry corn stalks and hay with lots of grain, and it cost us fully twice as much as it does now.

Corn silage $1 per ton, clover hay $6 per ton, and oats $24 per ton. Corn ensilage is the large southern white corn which will ripen here sufficient to grow, but it deteriorates in size and we do not plant home grown seed except for experiment. Clover hay is a good crop here, fully averaging two tons per acre, while our corn silage will go 20 tons. My average for the past five years has been more.

About twenty cows in the herd are giving milk, and from these, old and young, our average yield of butter is 250 lbs. or more, which at 25 cts. per lb., as I sell on contract, makes $62.50 per cow, and the skim milk from deep setting, with the butter milk, amounts to over $12.50 more per head as I feed it.

I adopted the silo seven years ago, and with my ten acres of corn every year for grain crop and dry feed, 20 to 25 head of cattle was the full capacity of my farm, and not as good results as now, with moist silage feed and winter butter, besides my miller's toll or cash for grinding and cost of carting to mill and back, made my winter keep of cattle fully twice as much per head as it now is.

Estimating cost of summer pasture at twenty-five cents per week, and then winter rations as given, the farmer cannot crowd $15 feed into the average dairy cow annually as I figure the cost.

Good liberal pasture feed, allowed to have a good growth in spring and not turn on to it until late, with silage until well towards the middle of May, solves the problem of cheapest feed for cattle.

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Pennsylvania.

59.—I have always fed steamed cut straw and corn stover occasionally as change of diet.

My gross receipts per cow were $192.00 per year. Can show receipts for every day in the year. I weighed my feed so often that you will find my figures practically correct. Sold my dairy and utensils, including milk route, March 3, 1893, for two reasons; first, I was robbing my farm of a vast amount of fertility by selling the whole milk, and second, because of the difficulty of securing proper and honest labor. I shall now breed Guernseys and sell cream.

60.—I find corn meal the greatest milk producing feed I ever tried; corn meal and ground oats about one half and one half with bran, middlings, a little oil meal, and roots, the best butter producing feed I ever tried.

My usual amount of cut feed, for a full grown cow, is about 15 pounds daily in two feeds, morning and afternoon. I try to have it two parts clover hay, one half part timothy hay, and one half part corn fodder; it is all steamed, and my grain ration thoroughly mixed with this cut feed at the time of feeding. After my cows have eaten this feed I give them a little (2 or 3 lbs.) of loose dry hay and some of them eat a very little straw (wheat). I always turn all my cows out in a well sheltered yard at about 8:00 a. m., and take them in at 4:00 p. m., unless the weather is very stormy; they have rough corn fodder before them all the time in the yard, and eat what they want of it, which is not much—should say not over 3 or 4 lbs. My cattle do much better, keep in good health and condition, without any signs of being forced or being fed more than they should be to do well; if they are kept in stable one or two days owing to bad weather, no matter how much hay or fodder they get, they fall off considerably in milk flow and butter fat. I have experimented considerably of late, and find my best results come from a grain ration of mostly corn meal and ground oats; wheat bran (the best to be had in Philadelphia) appears to be almost worthless. I also think very little of wheat shorts (middlings). I believe before long I will make my entire grain ration of corn, oats and oil meal; this, with good clover hay, a little timothy and corn fodder, and some good roots, carrots or beets, I believe will give the best all around results, health, milk and butter, as well as cheapness of feed being considered. I would prefer corn silage, but have it not, so steam my cut hay, which I consider next best.

I turn out to grass about May 1st and keep out until October 15.

I am after large milkers; when I have the milk, I am pretty sure of the butter.

61.—I think if I could get pea meal as cheap as cotton seed meal, I would add the same weight and improve my rations.

I keep a careful account of my feeding and weigh my feed whenever I make a change. My summer ration last year was an average of 2 lbs. of coarse bran per cow for May, June, July and August; the rest of the year

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was as given, except in September, when I fed 8 lbs. a day of coarse bran, No. 2 white middlings and a little corn meal, with run of pasture.

I am averaging 1¼ lbs. of fine butter per cow, and have 24 cows milking, with six cows dry, and heifers to come in this month and next.

62.—I have fed about this way for several years, but am now trying gluten meal in place of corn meal.

63.—The average yield of butter cannot be given, for the reason that milk is supplied to some five or six families, a total of some forty persons, and only what is left is churned.

We believe that our mature Jersey cows will average 6,000 lbs. of milk per year and 400 lbs of butter.

64.—Formerly I used wheat bran and cotton seed meal, but found that more linseed meal furnished the proper albuminoids, and good, well-eared corn silage gave the proper carbohydrates, and liked it the best.

65 —I think possibly corn silage and cotton seed meal would be valuable additions.

67.—Cost of ration per day, about 14 cents.

Texas.

68.—The feed I have down for each cow is the average amount. We feed some of our cows fully twice as much as we do others. In preparing the ration we carefully weigh each feed; then it is carefully mixed and each cow has her ration measured out to her dry. We try to feed all they will eat clean. We make a memorandum three times a month of the number of cows we milk. We count 2-year-old heifers and strippers as long as we save their milk. Cows do not eat as much here as they do farther north.

Our butter averages us 32 cents per pound for the year.

Utah.

69.—At times shorts were added in place of bran, and corn chop in place of barley.

At our prices I do not think I can improve the ration, unless it would do it by adding corn.

Our climate here, as you know, is very dry, and our hay can be perfectly cured and kept in stacks outside. On that account, and because corn does not grow well here, we do not put up silage. Lucerne, or alfalfa, is our main reliance for hay. The following are the ruling prices of cattle foods in our locality: Lucerne per ton. $3.50; bran $14, shorts $15, barley $20, corn, chopped, $25; oil cake meal $34, wheat $20, and oats $25.

Our best bred Holsteins will average 7,000 pounds of milk, testing from 3.2 per cent. to 3.4 per cent. I have "spotted" about 13 head to cull out; with what heifers coming on, I expect to have a good herd in a few years.

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Vermont.

71.—I have in my creamery a four-horse power Shipman engine run by kerosene at a cost of 8 cents an hour; it runs my separator, my churn, my Babcock test and my grist mill, saws my wood, cuts my silage and does my thrashing.

72.—Butter averaged in 1890, 374 lbs; in 1891, 366 lbs; and in 1892 (used a separator), 404 lbs.

Water warmed to 90°.

73.—I have often wondered whether any of the stations had taken up the theory that the cutting of the hay and mixing with the grain ration gave much greater returns for the food given, and demonstrated the cost of the extra labor and the relative increase in product of the dairy cow. I have convenient machinery for doing this, and often make that change in my feed; cutting, moistening with water, and mixing the grain ration has always given me quite a gain in milk and butter, but in no place except at some of the stations can this matter be thoroughly investigated.

74.—Having a breeding herd, I think it more profitable for me to feed a lighter ration and not force my cows.

I have a grass and hay farm and like to consume it on the farm; therefore feed a large quantity of hay.

West Virginia.

75.—Cost of keep per cow in 1890 (first year), $17; profit, $29.50; 1891, $33.50; profit, $68.50; 1892, $39; profit, $76.60.

See *Hoard's Dairyman*, May 26, 1893.

Washington.

76.—We consider alfalfa the cheapest feed we can have.

When the feed given is soaked or steamed it is as good as grass. When we turned out on grass, with 10 pounds of bran besides, they did not gain any on the other feed. We soak or steam all feed of the cows: it does not take near as much feed. We feed no long hay. We will try the silo this coming winter if we can grow corn satisfactorily.

Wisconsin.

78.—I consider six pounds of bran and two pounds pea meal the best and cheapest grain ration; cost of pea meal, $12 per ton, raised by myself.

79.—For part of the winter, ground oats were used instead of cotton seed meal, and since the change the cows have done better.

By changing 50 pounds of oats and corn, worth 45 cents, for 50 pounds of cotton seed meal, which cost 60 cents, we gained two pounds of butter or 60 cents, or a net gain of 45 cents per day. (See *Hoard's Dairyman*, June 9, 1893.)

80.—I vary the feed according to what I have; sometimes feed more corn and bran, and leave out the barley or oats, or both.

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The amount of butter made is 308 pounds per cow. You will see that by the pounds of milk, and the test, it should be more. This is accounted for by the fact that we are using considerable new milk and cream in a large family which is not counted, also that the test shows six tenths per cent. in my skim milk.

82—I mean to feed oil meal next winter.

83—I think the ration would be improved by feeding clear clover, and think the grain ration would be better by adding two pounds linseed or cotton seed meal and seven pounds bran and middlings.

84—Dry cows are fed the first five weeks what good straw they will eat, 30 pounds roots, one pound oil meal, five pounds hay and eight to ten coarse nubbins, substituting corn stalks for hay two days in seven. Three weeks before calving, add five pounds oat meal and one more pound oil meal. The last week I diminish the roots, giving only a few pounds the day before they calve.

I raise all the oats I feed, being careful to keep them sweet; I blow out all the dirt and have them finely ground. Bran could have been bought for $10 to $11 per ton, and I could have sold my oats for 36 cents a bushel, but I would not make the exchange. I do not feed grain during the last of May and June if the feed is excellent. I believe it is better for the cows to clean out of grain for a time once a year. I believe attempting to dry cows from three to six weeks before the next calf leads to much disorder. I am astonished to find so many of the sixteen dairymen reported in your Bulletin No. 83, claiming to milk their cows so near calving and then drying them off.

I could improve the ration fed to my cows the last year by cutting and mixing twelve hours before feeding, all the time they were in winter quarters. I could use much more straw and the cows seem to do better.

My roots do not cost more than 3 cts. a bushel, and often less.

86.—Most of my cows are presistent milkers, and I quite often have the trouble not to be able to dry them up at all, which I consider a loss. I have them come in during the whole year, except in the months from the middle of June to the middle of November, for the reason that I have to have quantity and quality alike during the whole year, in supplying private custom.

Screenings are steamed, and together with malt sprouts made into a slop. Oil meal and bran mixed and feed dry.

The principal reason I have for cooking the screenings is, that I fear to get foul seeds on to my land, as grinding alone does not always destroy fine seeds. For the past week I feed in place of screenings, bran 2 parts, and shorts 1 part, dry.

88.—Water at about 70° warmed with tank heater.

I never fed barley before, but like it when it is so cheap; have fed some corn and cob meal but it is ground too coarse; my cows have done the

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best this winter, and are looking fine. I think one main point is to keep the cows warm and give them a warm bed.

I weigh the milk the 1st and 15th of each montn and keep a record of it, so I can get at the amount each cow gives very close. They give from 5,700 to 10,000 pounds milk. I have been weeding out by the scales and not using the test, so I presume I have sold some of my best cows, but now I have put in the test too.

My account with my cows for 1892 stands like this: Ten cows up to September; eleven after September; cows Cr., by cash, $702.23; Dr., to feed and pasture (I charged them $10 a piece for pasture), $488.79; balance due cows, $214.44; and I had the manure and skim milk besides, and about five pounds milk each day to use in the house.

I plant three to four acres of sweet corn and ensilage corn for fall and early winter use. I begin to feed sweet corn as soon as the cows get in shape to give milk, generally have a good fall feed.

89.—Although my cows have done very well this winter, I think if I had fed four pounds middlings, three pounds oats and three pounds barley they would have done better.

Canada.

92.—I think the ration given can be improved by feeding more grain. This season I intend to sow a mixture of one bushel pease, two of goose wheat to six bushels of oats.

93.—The ration given is the best I have used and calculated to be a balanced ration of 1:5.5 to 6.5; for summer and fall from 1:5 to 6, and for winter 1:6 and 7. I find that more bulk and carbon is needed in winter.

After four years' practice I have converted a farm (120 acres of arable land) from a poor run-out, exhausted and unprofitable soil, and necessarily a cheap farm ($40 per acre) to a rich soil, profitable to work, and enhanced its value to $100 per acre or over. My summer crop for 1891 was: 800 tons ensilage corn, 1,000 bushels grain, 30 tons of hay, 22,000 pounds of milk, 43 calves; produced on 40 acres corn, 20 acres grain, 10 acres hay, 50 acres pasture.

In 1892: 40 acres corn, product, 600 tons silage; 25 acres hay or 70 tons; 20 acres grain or 1,200 bu.; 35 acres pasture, carrying 93 head, 40 milch cows, 10 dry and 43 yearlings.

Milch cows were fed four pounds of bran daily all summer.

94.—I had four acres of turnips; costs of production was: Rent of land $12, labor of putting in $14, seed $1, manure $30, taking them off $13, amounting in all to $70. I had 93 loads at 35 bu. per load, making 3,255 bu.; selling price 10 cts. per bu., making $325.05.

Six acres of silage, rent of land $18, labor of putting in $20, seed $2, manure $45, harvesting $46, making $131; from the whole ninety tons at $2, $180.

I think I brought my stock through very cheap; the yield of turnips may

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appear large to you for I suppose you do not grow any; it is correct, however, although a little above the average of each year. I find if you take a beast, feed him on turnips and straw, and have him a little thin, and then take another and feed him on grain and hay and have him in better form, when they have been on grass for two months the first one will come out ahead.

We grow our turnips in drills twenty-eight inches apart, thinned to one foot in drill.

I never tested my cows, but am going to going to get a Babcock tester, so I will know.

95.—Average yield per cow per year, 120 gallons of cream; I ship all my cream to Toronto at $1 per gallon.

96.—I have not had enough turnips to feed at all times and greatly miss them. More hay and meal do not give as good results as the turnips, and cost more.

Turnips 6 cts. per 60 lbs.; hay $6 per ton; oat chop $1 per 100 lbs.; bran 70 cts. per 100 lbs.

97.—We have sometimes fed ground oil cake, but it is too dear this year as compared with other foods.

99.—We think our silage seems to be hurting our cows, as since feeding it cows do not last near so long and are not in as good condition in the spring as when fed hay and roots in its place; the same men have been attending them for the past nine years. Corn does not mature properly in this country and probably this is the principal cause; anyhow we may be wrong, but this year will only feed a little. Our corn is always very much fermented, but stock like it and milk a good deal.

100.—Dry cows are fed clover hay 6 lbs., straw 3 lbs., corn silage 40 lbs. and sometimes a few pounds of dry meal are added. During summer, grass alone until late in the season, when dry meal and bran is sometimes used, but not generally; at this season I get my poorest results.

I keep water before the cows all the time; this seems to be a great improvement on watering them at stated times.

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Components of 100 American winter rations for dairy cows.

Feeding Stuffs.	1	2	3	4	5	6	9	10	13	15	16	18	19	20	22	24	26	27	28	29.	29b	31a	31b	33a	34	29c	29d	35	36
Corn silage	30	...	...	40	35	...	40	...	...	40	...	32½	40	40	27½	50	...	35	...	...	..	24	24	40	25	..	...	40	40
Corn fodder	...	10	...	...	...	...	...	...	24	...	...	3	.	...	...	...	...	...	10	...	..	...	...	10	...	...	..	...	...
Corn stalks	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	...	...	...	...	...	10	...	...	...
Mixed hay	...	...	...	...	10	...	...	...	...	...	...	...	5	6	...	8	...	...	20	5	15.8	..	...	...	7	10	15	15	...
Timothy hay	...	...	...	...	...	7½	8	10	...	2½	...	...	...	...	3½	...	11½	...	...	...	...	...	...	...	...	...	...	...	10
Clover hay	10	...	...	...	...	7½	...	10	...	2½	22½	6	5	...	3½	...	11½	10	...	5	5.9	...	...	...	...	..	5	...	...
Alfalfa hay	10	20	20	15	...	...	...	...	...	...	...	.	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	..	...
Oat straw	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...
Pea vines	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.	...	...	3.3	...	...	...	...	5	5	...	...
Wheat bran	5	13	2½	4	3	8	4	...	3½	7	...	...	2	...	3.6	3	...	5	2 9	..	...	2	2	4	5	...	...	4	5
Wheat shorts	...	...	2½	...	...	...	..	...	...	...	...	...	...	2	..	2	...	...	...	2	2	...	...	.	...	...	2	...	...
Wheat middlings	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...
Corn meal	2	4	...	4	..	...	2	8	5	...	12.7	5	...	...	...	...	...	5	5.7	...	...	8	4	...	4	...	...	2	. 3
Corn and cob meal	...	...	...	...	3	12	...	...	...	...	...	...	...	2	..	...	...	...	...	2	2	...	..	...	...	2	2	...	...
Oats	...	...	5	...	...	...	1	1½	...	...	4.9	...	...	...	½	1½	...	5	...	...	1	4	6	...	...	...	...	2	...
Barley	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	10	...	...	5	1	...	...	...	..	...	...	...	...
Rye	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1½	...	...	...	...	...	...	...	...	...	...	...	...	...
Cotton seed meal	...	3	1½	...	2	1¼	...	...	1½	...	...	...	1	...	...	...	...	...	...	2	...	...	...	2½	½	...	1	...	...
Linseed meal	...	...	...	..	...	1¼	...	...	1½	...	...	2	1	...	½	...	...	...	1.4	...	...	2	2	2	½	1½	...	2	2
Gluten meal	...	...	...	...	2	...	...	...	...	...	...	...	2	2	...	...	...	...	...	...	...	..	...	...	...	1½	1	...	...
Pea meal	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	..	...
Mangolds	...	35	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Components for 100 American winter rations for dairy cows.

Feeding Stuffs.	37	38	39	41	42	43a	43b	45	47	51	52	53	54	55	56	57	58	59	61	62	64	65	66	67	70	71	72	73	74
Corn silage	50			40				30		35	30			50	30		50	45			40		40	40	35	20	30	30	
Corn fodder						30	30				8								24	10		5							
Corn stalks															8	20													
Mixed hay	5	38	20	15	23				20			32						7		6		10	10	7	10	14	10	10	30
Timothy hay										4																			
Clover hay								12		4			25	8		10	9				8								
Oat straw																								1					
Wheat bran	4		2½	5	4	.6	.5			2	3	6	2		5	1		6	5.1	3½		3	4	2	2	3	4.2	2	1.9
Wheat shorts									3																				
Wheat middlings		4						8						5															.9
Corn meal				3	2	1.9	3		2½		3					8			5.1	2½		6	4		3.2		4.2	2	
Corn and cob meal			4½										3			3								2					
Oats						2.3	1.6						1½																
Barley																													
Rye	1																												
Cotton seed meal	1			2	2				2½	5	1							2	.3	1½			2		.8				
Linseed meal	2					.6	.8	1							1				2	1½	6			2	1		.8		
Gluten meal																										2		2	
Malt sprouts															4														
Mangolds													34			8													

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Components of 100 American winter rations for dairy cows.

Feeding Stuffs.	75	77	78	81	82	83	84	87	93	95	79	89	90	92	96	97	98	100	94	46	80	11	85	
Corn silage	48	30	40	26	25	40	45	24	45	30	32	40	17	40	40	50	30	40	15	40	...	20	...	...
Corn fodder	...	5	...	...	...	...	...	15	...	...	...	10	...	...	...	...	...	...	...	...	5½	3	10	...
Corn stalks	...	...	...	...	...	...	...	...	...	...	5	2	1.7	...	...	...	...	...	...	...	...	...	...	...
Mixed hay	...	8	...	...	...	...	...	...	5	12	...	...	...	5	...	...	7½	...	...	15	...	...	15	...
Timothy hay	...	...	...	5	...	5	...	...	...	...	...	...	17	...	...	...	...	...	...	...	12	...	...	...
Clover hay	...	...	8	10	10	5	12	5	...	...	5	...	...	...	8	10	...	7½	...	...	...	5	...	...
Wheat straw	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	...	1	...	...
Oat straw	...	...	...	...	...	...	...	...	...	...	2	2	2	5	½	3	6½	3	...	...	...	1	4	...
Wheat	2½	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Wheat bran	...	...	6	...	9	4½	...	5	5	...	8	...	1.7	4½	2	...	...	3	...	9	5	5	...	...
Wheat shorts	...	...	...	...	...	...	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wheat middlings	...	...	...	8	...	4½	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Corn meal	...	...	...	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	1	6	...	...	...
Corn and cob meal	2½	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Oats	2½	4	...	...	...	...	...	...	...	10	...	5	12.7	4½	2	2	2.5	1½	2½	1	2	...	8	...
Barley	2½	...	...	...	...	...	...	...	...	...	...	5	...	...	...	...	1.3	1½	...	1	2	...	...	...
Germ meal	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4½	...	...	...	...
Cotton seed meal	...	...	...	...	...	...	...	...	3	...	2	...	...	...	...	...	...	1	...	...	...	2	...	...
Linseed meal	...	...	...	1½	...	...	...	...	...	...	...	...	1.7	...	...	...	...	...	...	½	...	2	3	...
Pea meal	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	5	1.3	1½	2½	...	...	...	...	...
Potatoes	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7½	...	...	...
Turn	...	...	...	...	...	...	...	...	...	...	...	...	...	...	30	...	25	...	45	...	...	...	25	...

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Components of 100 American winter rations for dairy cows.

Feeding Stuffs.	14.	7.	8.	12.	17.	21.	23.	25.	30.	32.	33b	40.	44.	48.	49.	50	60.	63.	68.	69.	76.	86.	88.	91.	99
Corn silage	50	....	50	....	....	....	....	....	35	....	....	....	40	....	....	42	....	15	30	....	....	22	....	50	35
Sorghum fodder	....	....	....	....	50	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Prickly comfrey	....	....	....	....	....	....	....	....	....	....	35	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mixed hay	5	4	....	....	7½	....	....	....	7	20	....	....	....	....	....	....	....	10	....	....	....	....	....	....	8
Timothy hay	....	....	....	....	....	12	24	3½	....	....	....	4	....	9	12	2½	5	....	....	....	....	4	....	....	....
Rowen	....	....	....	....	....	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Clover hay	....	....	....	12	....	....	....	3½	....	....	....	15	....	9	....	2½	10	....	....	....	....	4	9	1	....
Alfalfa hay	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	35	15	....	....	....	....
Corn fodder	5	....	....	6	....	....	....	8	....	....	10	....	....	5	....	....	2½	....	....	....	....	....	19	5	....
Corn stalks	....	15	....	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	2	....	....	....
Sorghum hay	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	13½	....	....	....	....	....	....
Oat fodder	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Sheaf oats	....	....	....	....	....	....	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	5	....
Rye fodder	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Oat straw	1	....	....	....	....	....	....	....	....	....	....	....	....	2½	....	....	....	....	....	....	....	2	....	....	....
Barley straw	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....
Pea vines	....	....	....	....	....	....	....	....	....	....	....	....	....	2½	....	....	....	....	....	....	....	....	....	....	....
Wheat	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Wheat bran	....	3½	....	4	3.2	....	....	2	....	2	4	½	....	1	1	....	3.2	....	1.3	6⅔	7	1	3	6	1.2
Wheat shorts	....	3½	4	....	....	1.8	....	....	1½	....	....	....	....	....	....	....	....	....	....	....	7	....	....	....	....

(Continued on next page.)

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Components of 100 American winter rations for dairy cows—Continued.

Feeding Stuffs.	14	7	8	12	17	21	22	25	30	32	12b	40	41	48	49	50	60	63	68	69	76	86	88	91	99
Wheat middlings							12								1										1.8
Wheat screenings																						6			
Corn meal					3.2	2.6		3				1.3		1	2		6½	7	1.3				4		
Corn and cob meal	5															8									
Oats	1¼							3				½		1			2	5.4							1
Barley	1¼																			3½			3		
Rye bran														1											
Buckwheat bran		2½																							
Buckwheat middlings														1											
Cotton seed																			2.2						
Cotton seed meal						3			1½	2	2½		3	1.6	2				2.6					2.7	3
Linseed meal				1	1½			2	1½		2						1½					2		1.3	
Hominy meal		3½		4						2															
Gluten meal									1½																
Grano gluten			4																						
Brewers' grains, dried							5									14									
Brewers' grains, wet									20																
Malt sprouts																					2	2			
Corn starch feed													18												

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Millet	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	
Carrots	..	...	...	...	...	...	...	...	...	..	..	5.7	...	...	...	...	15	...	...	...	...	...	...	..		30	
Rutabagas	...	...	...	..	...	...	...	3	..	.	...	...	...	..	...	..	...	...	...	...	...	...	...	...		...	
Sugar beets	...	..	...	...	...	...	...	...	..	...	..	...	...	..	...	...	...	22	...	...	..	...	..	...		..	
Skim milk	...	..	...	...	...	...	...	...	.		..	...	...	...	40	...	...	...	...	...	...	...	...	..		...	

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NUTRIENTS IN RATIONS.

The nutrients in the rations given in the preceding pages are shown in the following table. The composition and the digestibility of the various feed stuffs were taken from the compilation to be published in the forthcoming tenth annual report of this Station, which table in the main is a reprint of that on pp. 318-320 of our last annual report. For an explanation of technical terms used in the table and in discussions throughout this bulletin, see the chapter on Composition of Feeding Stuffs by the writer, pp. 314-325, of the report last mentioned, or any handbook on the systematic feeding of cattle. For the sake of comparison the components of the rations have all been calculated per 1,000 lbs. live weight.

Nutrients in 100 *American winter rations for dairy cows, in lbs.*

No.	Dry Matter.	Digestible Matter.				Nutr. Ratio.
		Protein.	Carbhydr.	Fat.	Total.	
olorado.						
1.....	31.09	2.70	15.78	.80	19.28	1:6.5
2	35.65	4.34	18.12	1.10	23.56	1:4.7
3	30.09	3.14	14.01	.81	17.96	1:5.0
4..... ...	24.92	2.06	13.35	.70	16.11	1:7.2
Average...	*30.44*	*3.06*	*15.32*	*.85*	*19.23*	*1:5.6*
Connecticut.						
5.....	*25.70*	*2.69*	*13.96*	*.97*	*17.62*	*1:6.0*
linois.						
6..... .	22.09	2.37	12.06	.75	15.18	1:5.8
7.....	19.06	1.50	10.67	.51	12.68	1:7.9
8	19.20	2.17	10.24	.93	13.34	1:5.7
9.....	23.36	1.58	13.24	.65	15.47	1:9.8
10.....	22.72	1.60	13.02	.65	15.27	1:9.0
Average...	*21.29*	*1.84*	*11.85*	*.70*	*14.39*	*1:7.2*
Indiana.						
11	26.08	3.24	12.94	1.07	17.23	1:4.7
12.....	27.03	2.76	14.30	.90	17.96	1:5.9
13.....	27.81	2.54	16.61	.92	20.07	1:7.3
Average...	*26.97*	*2.85*	*14.61*	*.96*	*18.42*	*1:5.9*

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Nutrients in 100 *American winter rations for dairy cows, in lbs.*—continued.

No.	Dry Matter.	Digestible Matter.				Nutr. Ratio.
		Protein.	Carbhydr.	Fat.	Total.	
Iowa.						
14	24.77	1.34	15.01	.76	17.11	1:12.8
15	22.06	1.81	12.16	.70	14.67	1:7.6
16	32.80	2.81	18.00	1.09	21.91	1:7.3
Average	*26.58*	*1.99*	*15.05*	*.85*	*17.89*	*1:8.5*
Kansas						
17	*17.39*	*1 36*	*10.43*	*.48*	*12.27*	*1:8.5*
Kentucky.						
18	*24.62*	*2.38*	*14.04*	*.91*	*17.33*	*1:6.7*
Massachusetts.						
19	19.96	2.15	10.43	.75	13.33	1:5.7
20	19.72	1.53	11.30	.63	13.46	1:8.3
21	30 31	2.80	15.63	.99	19.42	1:6.4
Average	*23 33*	*2.16*	*12.45*	*.79*	*15.40*	*1:6.6*
Michigan.						
22	18.45	1.45	10.08	.55	12.08	1:7.8
23	34.32	2.41	18.49	.74	21.64	1:8 3
Average	*26 39*	*1 93*	*14.28*	*.65*	*16 86*	*1:8.1*
Minnesota.						
24	19.09	1.40	11.10	.48	12.98	1:8.7
25	19.32	1.75	10.64	.60	12.99	1:6.8
26	25 61	1.92	14.75	.41	17.08	1:8.2
Average	*21 34*	*1.69*	*12.16*	*.50*	*14 35*	*1:7 9*
Nebraska.						
27	22.47	1.83	12.27	.71	14.83	1:7.5
28	29.96	2.15	17.18	.73	20.06	1:8.7
Average	*26.22*	*2.00*	*14.73*	*.72*	*17.45*	*1:8.2*
New Hampshire.						
29 a	25.50	2.39	14.37	.70	17.46	1:6.7
29 b	28.97	1.88	15.47	.53	17.88	1:8.8
c	26.12	2.21	13.65	.65	16.54	1:6.7
29 d	23.86	2.84	13.68	.82	17.34	1:5.5
30	20.33	2.51	10.19	.91	13 61	1:4 9
Average	*23 84*	*2.43*	*12.24*	*.79*	*15 46*	*1:5.8*

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Nutrients in 100 *American winter rations for dairy cows, in lbs.*—continued.

No.	Dry Matter.	Digestible Matter.				Nutr. Ratio.
		Protein.	Carbhydr.	Fat.	Total.	
New Jersey.						
31 a	19.41	2.06	11.71	.87	14.64	1:6.5
31 b	17.72	1.96	10.09	.79	12.84	1:6.0
Average.	*18.57*	*2 01*	*10.90*	*.83*	*13.74*	*1:6.0*
New York.						
32	26.19	2.36	13.78	.79	16.93	1:6.6
33 a	21.41	2.63	11.42	.78	14.83	1:5 0
33 b	15.59	2.21	7.78	.54	10.53	1:4.1
34	19.98	1.81	11.46	.66	13 93	1:7.1
35	34 81	2.80	19.29	1.07	23.16	1:7.7
36	23.38	1.94	13.15	.77	15.86	1:7.7
37	25.92	2.39	14.99	1.07	18.45	1:7.3
38	23.38	1.27	12.63	.36	14.26	1:10.6
39	21.69	1 33	13.27	.40	15.00	1:10.6
40	22.13	1.60	11.10	.47	13.17	1:7.6
41	33.18	2.89	18.24	1.12	22.25	1:7.5
42	27.75	2.44	14.65	.75	17.84	1:6.7
43 a	28.37	1.81	16.90	.85	19.56	1:10.4
43 b	30.14	2.01	18.19	.93	21.13	1:10.1
44	18.29	2.62	9.95	1.06	13.63	1:4.7
45	28.65	2.87	14.73	.88	18.48	1:5.8
46	29.16	2.41	16.98	.85	20.24	1:7.8
47	28.36	2.70	14.90	.88	18 48	1:6.2
48	24.53	2.13	12.01	.67	14.81	1:6 3
49	25.73	3 50	14.05	1.12	18.67	1:4.7
50	31.30	3.37	16 31	1.31	20.99	1:5.7
51	18.87	2.68	8.94	.84	12.56	1:4.1
Average.	*25.55*	*2.37*	*13.88*	*.84*	*17.09*	*1:6.6*
North Carolina.						
52	*20.38*	*1.79*	*11.98*	*.80*	*14.57*	*1:7.7*
North Dakota.						
53	*27.64*	*1.74*	*14.86*	*.45*	*17.05*	*1:9.1*

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Nutrients in 100 American winter rations for dairy cows, in lbs.—continued.

No.	Dry Matter.	Digestible Matter.				Nutr. Ratio.
		Protein.	Carb-hydr.	Fat.	Total.	
Ohio.						
54	18.53	1.72	9.07	.47	11.26	1:5.9
55	20.26	1.53	10.95	.63	13.11	1:8.1
56	16.77	1.91	9.13	.48	11.52	1:5.8
57	26.63	1.80	15 76	.67	18.23	1:9.6
58	15.98	1 03	8.48	.40	9.91	1:9.1
Average	*19.63*	*1.59*	*10.68*	*.53*	*12.80*	*1:7.5*
Pennsylvania.						
59	19.87	2.01	10.59	.69	13.29	1:6 0
60	27.55	2.60	17.47	.90	20.97	1:7.5
61	26.52	2.53	15 74	.90	19.17	1:7.0
62	20.05	2.31	11 00	.72	14.03	1:5.4
63	26.36	1.85	16.06	.79	18.70	1:9.6
64	23.43	2.82	11.53	.93	15.28	1:4 8
65	23.84	1 69	14 27	.64	16.60	1:9.8
66	24.23	2.20	13.54	.92	16.66	1:7.2
67	20.30	1.62	11.30	.64	13.56	1:7.8
Average	*23.57*	*2.18*	*13.50*	*.79*	*16.47*	*1:7.0*
Texas.						
68	*26 58*	*2.21*	*12 31*	*1.30*	*15.82*	*1:6.9*
Utah.						
69	*31.63*	*3.20*	*15.36*	*.57*	*19.13*	*1:5.2*
Vermont.						
70	25.99	2.06	14.57	.89	17.52	1:8.0
71	20.22	1.64	11.09	.48	13.21	1:7.4
72	21.23	1.86	14.03	.75	16.64	1:8.4
73	27 25	2.16	15.59	.79	18.54	1:8.0
74	26.06	1.42	14.02	.38	15.82	1:10.5
Average	*24 74*	*1.83*	*13.86*	*.66*	*16.35*	*1:8.4*
West Virginia.						
75	*22 37*	*1.54*	*14.15*	*.72*	*16.41*	*1:10.2*

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Nutrients in 100 American winter rations for dairy cows, in lbs.—continued.

No.	Dry Matter.	Digestible Matter.				Nutr. Ratio.
		Protein.	Carbhydr.	Fat.	Total.	
Washington.						
76	*21.60*	*2.68*	*10 54*	*.55*	*13.77*	*1:4.4*
Wisconsin.						
77	18.05	1.26	10.19	.44	11.89	1:8.9
78	25.16	2.40	13.60	.66	16.66	1:6.3
79	27.24	2.86	13.80	.92	17.58	1:5.5
80	27 31	2.01	16.50	.76	19.27	1:8.9
81	31.00	3.01	16.02	.87	19.90	1:6.0
82	23.63	2.34	12.17	.64	15.15	1:5.8
83	25.24	2.12	13 65	.68	16.45	1:7.1
84	34.32	2 85	18.79	1.12	23.76	1:7.5
85	26.90	2.11	14.43	.70	17.24	1:7.6
86	25.25	2.54	13.28	.63	16.48	1:6.2
87	22.13	1.66	12.32	.57	14.55	1:8.2
88	24.42	1.35	14.22	.59	16.66	1:8.4
89	24 79	1 59	15.62	.86	17.47	1:10.6
90	25.17	1.65	13.35	.62	15.62	1:8.9
91	23.79	2.73	12.46	.99	16.18	1:5.4
Average	*25.63*	*2.19*	*13.98*	*.74*	*16 91*	*1:7.2*
Canada.						
92	19.70	1.36	10.60	.53	12 49	1:8.7
93	23.95	2.78	12.46	.97	16.21	1:5.2
94	15.61	1.05	8.49	.31	9 85	1:8.7
95	23.98	1.58	13 07	.74	15.39	1:9.3
96	17.13	1.23	9.29	.51	11.03	1:8.5
97	23.78	2.03	12.89	.54	15.46	1:6.9
98	26.51	1.49	14.87	.57	16.93	1:10.8
99	20.52	2.23	11.44	.79	14.46	1:5.9
100	22.96	2 08	12.17	.71	14.96	1:6 6
Average	*21.57*	*1.76*	*11.69*	*.63*	*14.08*	*1:7.4*

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DISCUSSION OF RESULTS.

Number of cows.—The hundred herds, the feeding of which we are considering in this bulletin, contained in the aggregate 2,921 cows in milk during the winter of 1893; the herds contained from 5 to 150 animals, the average number being 29 animals.

Breeds represented.—Nearly all the different breeds of milch cows found in this country are represented in the herds; the Jerseys lead, and next in number come the Holsteins, Short Horns, Guernseys and Ayrshires, in the order given, with single representatives of the Brown Swiss, Red Polled and Devon cattle.

Yield of milk and butter.—Referring to the comment on these figures on p. 4 of the present bulletin, we note that the average annual yields of milk and butter reported were 6,314 lbs. and 303 lbs. per head, respectively; 68 farmers reported their average yields of milk and 51 those of butter. The yields range from 3,000 to 12,000 lbs. of milk, and from 165 to 497 of butter.

Average per cent. of fat in herd milk.—The average per cent. of fat in herd milk was reported by 54 farmers; the figures range between 3.5 and 6.0 per cent., with a general average of 4.59 per cent.

The farmers giving the average fat content of their herd milk were not always the same as those reporting the annual milk and butter product per cow, so that the average figures for these dates are not directly comparable. In going over all the figures carefully it seems very likely that the average yield of butter reported is very nearly correct; while it may have been overestimated in some cases, in others no allowance was made for the milk consumed as such, so that the average may be considered about right, that is, a little more than 300 pounds of butter per year per cow.

This is a good average yield and may be considered a good standard. It has been exceeded by our dairymen only by a careful system of grading up of their herds and weeding out of poor cows, along with rich feeding and application of modern methods of creaming and churning. While our best dairymen do still better than this, exceeding the average by one hundred, and in single instances by nearly two hundred pounds, the majority of dairy farmers do not reach it. The only way in which such a result can be reached, is by following the example set by men like those whose work is reported in the preceding pages; by a careful study of all conditions entering into the dairy business as factors, the kind of cows kept, the system of feeding, the making and sale of the products, etc.

Of late years it has come to be considered more and more essential to learn the value of each individual cow in the herd; for this a Babcock milk tester and a reliable pair of scales are indispensable, and also a looking into the feed account of each cow; the best cows are the ones that give the largest quantity of products at the least relative expense of food and labor, and neither they nor the poor cows in the herd can be found out except

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by a careful study of both food consumed and products obtained in each single case. This means opening up an account with each individual cow in the herd, in a measure in the same way as a store keeper keeps a special account with each customer.

Time during which cows go dry.—As will be learned by a glance at the tables pp. 5-11, the practice followed by the majority of farmers in regard to the drying off of cows is to give them a rest of from one to two months previous to calving. Some farmers report that they cannot dry off their cows, or only with difficulty, but they are in the minority; the practice of milking up to the time of calving is strongly condemned by the best authorities; it impairs the constitutional strength of both mother and calf, and reduces the production of milk or butter during the subsequent period of lactation.

The time when the cows are generally dried off, is governed by local conditions and business methods. If a farmer has a winter dairy, or supplies milk or cream to a creamery, he will dry off his cows in the latter part of the summer when dairy products are low; if he delivers milk or supplies butter to private customers he wants about the same quantity of milk the year around, and arranges it to have his cows come in at all seasons, etc.

Feeding stuffs used.—The list of rations given on pp. 12–17, includes three succulent feeds, eighteen coarse dry fodders, twenty-seven concentrated feed stuffs, six kinds of roots and tubers, and one miscellaneous feed (skim milk) in all 56 different kinds of feeds; nearly two thirds of the rations are made up of the twenty two feeding stuffs given on p. 32, however. The following list shows the number of times which the more important feeds appear in the rations; it will give a good idea of their relative economy and the favor in which they are held as winter feeds for dairy cows by our farmers.

Corn silage	64 times.	Corn meal	42 times.
Roots	13 times.	Corn and cob meal	14 times.
Corn fodder and stalks	35 times.	Wheat	3 times.
Mixed hay	42 times.	Oats	35 times.
Timothy hay	21 times.	Barley	13 times.
Oat straw	16 times.	Linseed meal	37 times.
Clover hay	40 times.	Cotton seed meal	35 times.
Wheat bran	73 times	Pea meal	6 times.
Wheat shorts	13 times.	Malt sprouts	3 times.
Wheat middlings	11 times.	Gluten meal	8 times.

Nutrients fed in the various rations.—The tables on pp. 38–42, show the nutritive groups in the various rations, calculated per 1,000 lbs. live

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weight. As only a few rations were secured from some of the states, the average figures for each state do not offer reliable data for comparison In the following table the states represented have been grouped in this manner:

New England States.—New Hampshire, Vermont, Massachusetts, Connecticut.

Middle States.—New York, New Jersey, Pennsylvania, West Virginia.

Central States.—Illinois, Indiana, Ohio, Kentucky, Iowa, Kansas, Nebraska.

North Central States.—Wisconsin, Michigan, Minnesota, North Dakota.

Southern States.—North Carolina, Texas.

Rocky Mountain States.—Colorado, Utah.

Pacific States.—Washington.

Including the rations given in the tables referred to under these groups we have the following summary:

Nutrients in rations for dairy cows.

	No. of rations.	Dry matter.	Digestible Matter.				Nutr. Ratio.
			Protein	Carbhydr.	Fat.	Total.	
New England States	11	24.28	2.10	13.19	.75	16 04	1:7.1
Middle States	31	24.65	2.27	13.68	.82	16.77	1:6.8
Central States	20	22.97	1.97	12.78	.72	15 47	1:7.3
North Central States	21	25.79	2.03	13.79	.68	16.55	1:7.3
Southern States	2	23.48	2.00	12.14	1.05	15.19	1:7.2
Rocky Mountain States	5	30.81	3.12	15.39	.79	19.30	1:5.5
Pacific States	1	21.60	2.68	10.54	.55	13.77	1:4.4
Canada	9	21.57	1.76	11.69	.63	14.08	1:7.4

We notice here a general similarity in the make up of the rations considered in the preceding pages; excluding the six rations from the Rocky Mountain states and Washington, the average rations vary only slightly, and practically not at all in the relation of nitrogenous to non nitrogenous digestible constituents (nutritive ratio), which in all cases is about as 1:7. The rations therefore corroborate the results found by an examination of all data on this point available when published in the last annual report of this station by the writer. Including the twenty-eight rations previously published, and combining the New England and Middle states, the Central and North Central states, the Rocky Mountain states and Washington, we have the following table of summary:

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Summary of rations for dairy cows.

	No. of rations.	Dry matter.	Digestible Matter.				Nutr. Ratio.
			Protein.	Carbh	Fat.	Total.	
Eastern states	55	21 38	2 20	13.81	.77	16.28	1:6.8
Middle states	56	21.64	2.08	13 87	.72	16.17	1:7 2
Southern states	2	23.48	2.00	12.14	1 05	15.19	1:7.2
Western states	6	29.23	3.05	14 58	.75	18.38	1:5.3
Canada	9	21.57	1.76	11.69	.63	14.08	1:7.4

As will be seen, the average rations fed in the Eastern, Southern and Middle states are very nearly identical; the Canadian rations are all lighter rations than these (with but one exception), while the nutritive ratio is slightly wider. An examination of the table on p. 11 will suggest the reason for the light Canadian rations; eight out of the nine farmers reporting give their specialty of farming as breeding.

The western rations are greatly heavier and of a narrower nutritive ratio, owing to the large extent to which alfalfa enters into the rations. The number of rations secured from these states is too small, however, to allow of generalizations as to the system of feeding practiced there.

Combining all the above 128 rations which have been fed by successful dairy farmers and breeders in the various parts of our continent, we have the following average American ration, as it may be called, as against the rations published by German experimentors, and heretofore largely used in this country.

American standard ration for dairy cows.

	Dry Matter.	Digestible Matter.				Nutritive Ratio.
		Protein.	Carbohydr.	Fat.	Total.	
Average for 128 herds	*24.51*	*2.15*	*13.27*	*.74*	*16.16*	*1:6.9*

This ration is practically the same as the one published in Bulletin 33 and in our Ninth Report; it is believed that it will be found correct for our American conditions, except perhaps for those of the Rocky mountains and the Pacific states. While local conditions or the business methods of farming in some places may make a ration desirable which contains more protein than this, and has a narrower nutritive ratio as a consequence, we

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feel confident that in the large majority of cases its adoption will give satisfactory results, and that it is preferable to the German standard ration so long placed before our stock feeders as the ideal one, the nutritive ratio of which is 1:5.4. It is the result of American feeding experience; the majority of our most successful dairymen feed in the way indicated by the ration, and we shall not go far amiss if we follow their example.

The practical importance of this matter lies in the fact that the nitrogenous feed stuffs are our most expensive foods; as the results published in this bulletin plainly show, it will not as a rule be necessary to supply our cows with such quantities of them as to bring the proportion of nitrogenous to non-nitrogenous digestible components in their ration down to 1:5.4. Usually we shall not need to feed more than one-seventh as much of the former as we do of the latter; hence we can make up the rations to a large extent of feeds like corn fodder, corn silage, mixed hay, clover hay, corn, oats, pease, etc., and need only supply the expensive, highly nitrogenous foods in small quantities.

As regards the importance of rations and feeding standards in general, their uses and limitations, etc., the reader is referred to the discussions on the subject in the Ninth Annual Report of the Wisconsin Experiment Station. While we may be guided to some extent by their teachings, we must not be led blindly; the question of the proper kinds and classes of food stuffs to feed for any single purpose is one of practical economics and not one of physiological chemistry.

As the market price of cattle foods and the local conditions vary to such a great extent with different regions, it is evident that no universal "best" ration for milch cows or for any other animals can be given. It is believed, however, that any dairy farmer can easily select from the abundant material in the preceding pages a ration suited to his conditions.

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EDUCATING STUDENTS TO BE STOCKMEN.

John A. Craig, Professor of Animal Husbandry, University of Wisconsin, College of Agriculture, Madison, Wis.

During the past three years it has been part of the work of the students taking the course in animal husbandry to make a close study of the merits of the different classes of farm live stock. It is widely known that there is a dearth of capable judges of the various kinds of stock and it was thought in starting this line of teaching that while it would surely be helpful to all the students in their farm operations, it might be the means of making a few of them expert judges. Ample evidence of the scarcity of persons possessed of the knowledge of a live stock judge has come to us in the fact that there will will likely be twenty of the students who have had this training judging at the county fairs of Wisconsin and Illinois. The incentives to the students to acquire skill in this direction have been Mr. R. B. Ogilvie's annual donation of a gold medal to the student showing the greatest profiency in jdging draft horses and mutton sheep, and in addition, the recognition of the utility of this line of instruction on the part of the students. As the course of instruction is to an extent original and the subject one of general interest though not widely studied, it will likely be of sufficient interest to justify a detailed description of the methods that are followed.

THE GENERAL PRINCIPLES UTILIZED.

In reference to the general principles utilized in framing the course of instruction, it may be said that it was recognized at the outset that the chief factors requiring development in the student were observation and judgment. The eye, and in a lesser degree the hand, must be trained so as to be an effective agent in detecting defects while the judgment must be capable of acting quickly in determining the effect that such may have on the utility of the animal or its value. In conformity with this, it was realized that the student must come in the closest

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contact with the animal and he must have such a guide as a score card to direct and quicken his judgment. To strengthen his own judgment he must be largely his own teacher as well as the student. In the lectures of the class room the parts of the animals were studied as the mechanism of a machine should be and the ideas there reasoned out were afterwards adjusted to the living animal and in this way the judgment and reasons for it were always connected.

APPLICATION OF THE PRINCIPLES.

To make the judging as instructive and complete as possible, it was divided into two stages: the one elementary, in which the score card was the chief feature and the other advanced in which comparative judging without the use of score cards, and similar to that done at most exhibitions, was adopted. The score card might be compared in its use to the alphabet. As the letters enable one to make words, so the parts of the score card were agents in enabling the student to imprint on his mind the form and the qualities of the ideal animal. Not only that, but it directed him to look for certain points and it still further drilled him into a system of scanning an animal so that no detail of conformation would be overlooked. To the student who wishes to learn the elements of correct judging the score card is a valuable means towards that end, but to the experienced judge, it is at best but an impediment in making quick and correct decisions when a number of animals are together for comparison. It is for this reason that comparative judging outgrows the score card in the student's work. As soon as the student has mastered the points of the different types of animals in detail and is able to value these points correctly and do it systematically he is then considered prepared for advanced judging in which the animals are arranged in classes according to age as they are at all exhibitions.

THE NATURE OF THE SCORE CARD.

The nature of a score card must be such as to give it the greatest utility and that is only secured by making it simple. To assist in this the cards relating to the different classes of

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stock were made as uniform as possible in arrangement and each card was made to have reference to the type of animal that was the most common in the markets. For this reason the sex characteristics were overlooked in the preparation of the cards and only considered in the comparative judging. For instance the card relating to light horses was drawn up to apply to the coach or carriage horse and not to the saddler, trotter, or the cob horse but in the advanced judging the difference in these types were made as clear as possible. In draft horses, the draft gelding most desirable in the market was considered in preparing the card; in the card relating to dairy cattle the dairy cow was the type chosen and in that relating to beef cattle the steer, ripe for the market, was the model, and so on in the instance of the sheep and swine. When the student grasped the money value of the different types in the common market he was then initiated into the various details that the breeder of pure bred stock has to include in his judgment.

APPLYING THE CARD TO LIGHT HORSES.

In scoring light horses the livery stables of the city were freely used. A horse suitable for instruction would be brought out and tied and each student would begin to score it.

They were first instructed in the matter of telling the age from the order of the appearance of the incisors up to five years, from five to ten by the appearance of the mark, and from ten upwards they would guess at it from the shape of the incisors and their slope. After doing this the height in hands was estimated and the weight also and these were determined accurately when the score cards had been collected. In addition to filling out the card as indicated in the scale of points given below an estimate of the horse's market value was reported on the card. When the scoring of the horse was completed by each student, the class would go over the animal together and all corrections duly noted.

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Students scoring a Shorthorn cow in the Experiment Station herd, with the score card, for beef cattle.

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SCALE OF POINTS.—LIGHT HORSES.	Perfect Score.	Points Deficient: Stud'ts Score.	Points Deficient: Corrected.
A. *AGE*			
B. *GENERAL APPEARANCE:*			
Weight, ...lbs.; actual			
Height, 16 hands; estimated hands....actual	2		
Form, type....symmetrical, smooth, stylish	4		
Quality, bone clean, firm; tendons, defined; hair and skin fine	8		
Action, step smooth, long, active; trot rapid, straight, regular	8		
Temperament, active, good disposition	5		
C. *HEAD AND NECK:*			
Head, lean, straight	1		
Muzzle, fine; nostrils large; lips thin, even; teeth sound.	1		
Eyes, full, bright, clear, large	1		
Forehead, broad, full	2		
Ears, medium size, pointed; well carried	2		
Neck, muscled; crest high; throatlatch fine; windpipe, large	2		
D. *FOREQUARTERS:*			
Shoulder, long, smooth, oblique, extending into back	3		
Arm, short, thrown forward	1		
Forearm, muscled, long, wide	2		
Knees, clean, wide, straight, deep, strongly supported	2		
Cannons, short, wide; sinews, large, set back	2		
Fetlocks, wide, straight	1		
Pasterns, strong, angle with ground 45°	3		
Feet, medium, even size; horn dense; frog large; bars strong; sole concave; heel, wide, high	8		
E. *BODY:*			
Withers, muscled	1		
Chest, deep, low; large girth	3		
Ribs, long, sprung, close	2		
Back, straight, short, broad, muscled	2		
Loins, wide, short, thick	2		
Underline, long, flank let down	1		
F. *HINDQUARTERS:*			
Hips, smooth, wide, level	2		
Croup, long, wide, muscular			
Tail, attached high, well carried	1		
Thighs, long, muscular, spread, open and led	2		
Quarters, heavily muscled, deep	3		
Gaskins, or lower thighs, long, wide, muscular	2		
Hocks, clearly defined, wide, straight	8		
Cannons, short, wide; sinews large, set back	2		
Fetlocks, wide, straight	1		
Pasterns, strong, sloping	2		
Feet, medium, even size; horn dense; frog large, elastic; bars strong; sole, concave; heels, wide, high	6		
Total			
Estimated market value			

Animal .....

Student.....*Date*.....

THE CARD FOR DRAFT HORSES.

After the students had been working every afternoon for three weeks or so on the points of light horses and were well

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acquainted with these and the common diseases as well, they were prepared to master the scoring of draft horse in a short while. The essential differences in type as far as they contribute to strength and wearing qualities in the draft horse and speed, style and stamina in the light horses were carefully compared. The card is arranged similar to that on light horses but it is only of interest to give the scale of points as follows:

SCALE OF POINTS.—DRAFT HORSES.	Perfect Score.
A. *AGE*	
B. *GENERAL APPEARANCE:*	
Height, estimated ..... actual	
Weight, over 1 00 lbs.; estimated ..... lbs.; score according to age	4
Form, broad, massive, proportioned	4
Quality, bone smooth, hard; tendons lean, skin and hair fine	8
Action, step smooth, quick, long; trot rapid, straight, regular	4
Temperament, energetic, good disposition	5
C. *HEAD AND NECK:*	
Head, lean, medium size	1
Muzzle, fine; nostrils large; lips thin, even	1
Eyes, full, bright, clear	1
Forehead, broad, full	2
Ears, medium size, well carried	1
Neck, muscled; crest high; throatlatch fine; windpipe, large	1
D. *FOREQUARTERS:*	
Shoulder, sloping, smooth, snug, extending into back	3
Arm, short, thrown back	1
Forearm, heavily muscled, long, wide	2
Knees, wide, clean cut, straight, deep, strongly supported	2
Cannons, short, lean, wide; sinews, large, set back	2
Fetlocks, wide, straight, strong	1
Pasterns, sloping, lengthy, strong	3
Feet, large, even size; horn dense; sole, concave; bars strong; frog large; elastic; heel, wide, one half length of toe and vertical to ground	8
E. *BODY:*	
Chest, deep, wide, low; large girth	3
Ribs, long, close sprung	2
Back, straight, short, broad, muscular	3
Loins, wide, short, thick, straight	2
Underline, flank low	1
F. *HINDQUARTERS:*	
Hips, smooth, wide	2
Croup, wide, muscular, low set	3
Tail, attached high, well carried	1
Thighs, muscular	3
Quarters, deep, heavily muscled	4
Gaskins, or lower thighs, wide, muscled	
Hocks, clear cut, wide, straight	3
Cannons, short, wide; sinews large, set back	2
Fetlocks, wide, straight, strong	1
Pasterns, sloping, strong, medium length	2
Feet, large, even size; horn dense; dark color; sole concave; bars strong; frog large, elastic; heel wide, one-half length of toe and vertical to the ground	6
Total	100

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SCORING DAIRY CATTLE.

The score card for dairy cattle was prepared on the assumption that it was to be applied only to cows that were milking and in such the various parts would have reached their fullest development. It may be noticed that the features indicate constitution and those that are directly concerned in the making of the milk have received much higher valuation than those that relate solely to fancy points. It was not expected from the students that they could discriminate with the card between the animals of the highest value but they soon became able to make the proper difference in scoring a cow that was bad in form and other qualities and one that was good. They became acqainted thoroughly with the evidences of constitution, a point which breeders must consider before all others.

SCALE OF POINTS.—DAIRY CATTLE.	Perfect Score.
A. *GENERAL APPEARANCE:*	
Weight, estimated..... lbs.; actual..... lbs.	
Form, wedge shaped as viewed from front, side and top; weight 800 to 1,000 lbs.....	8
Quality, hair fine, soft; skin mellow, loose, medium thickness, secretion yellow; bone clean.....	8
Temperament, nervous, indicated by lean appearance...	5
B. *HEAD AND NECK:*	
Muzzle, clean cut; mouth large; nostrils large.....	1
Eyes, full, mild, bright.....	1
Face, lean, long; quiet expression.....	1
Forehead, broad, full.....	2
Ears, medium size, yellow inside, fine texture.....	1
Neck, fine, medium length; throat clean; light dewlap...	2
C. *FOREQUARTERS:*	
Withers, lean, thin.....	1
Shoulders, light, oblique.....	2
Legs, straight, short; shank fine.....	3
D. *BODY:*	
Chest, deep, low; girth large.....	8
Ribs, broad, long, wide apart; large stomach.....	10
Back, lean, straight, open jointed.....	3
Loin, broad.....	3
Flank, low.....	1
Navel, large.....	2
E. *HINDQUARTERS:*	
Hips, far apart; level between hooks.....	2
Rump, long, wide.....	2
Pin bones, or thurls, high, wide apart.....	1
Tail, long, slim; fine switch.....	1
Thighs, thin, long.....	2
Escutcheon, spreading over thighs, extending high and wide; large thigh ovals.....	2
Udder, long, attached high and full behind, extending far in front and full; quarters even, free from fleshiness..	15
Teats, large, evenly placed.....	4
Milk veins, large, tortuous.....	3
Milk wells, large.....	3
Legs, straight, far apart, shank fine.....	3
Total.....	100

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THE POINTS OF BEEF CATTLE.

In the instance of beef cattle, the card applies only to the steer that is finished for market; but in the work of instruction steers were divided into two classes, the store steer ready to be fattened and the finished steer ready for the market. In the first the evidences of quick feeding qualities, suitable form, pliable skin and mellow handling were emphasized above all others while in the instance of the fattened steer, the evidences of maturity from a butcher's point of view were chiefly considered.

SCALE OF POINTS.—BEEF CATTLE.	Perfect Score.
A. *GENERAL APPEARANCE:*	
Weight, estimated.. ..... lbs ; according to age.....	6
Form, straight top line and underline; deep, broad, low set.....	8
Quality, firm handling: hair fine; pliable skin: dense bone; evenly fleshed.....	8
Style, active, upstanding	1
Temperament,.....	5
B. *HEAD AND NECK:*	
Muzzle, fine; mouth large; lips thin; nostrils large.....	1
Eyes, large, clear, placid.....	1
Face, short; quiet expression.....	1
Forehead, broad, full....	1
Ears, medium size, fine texture.....	1
Neck, thick; short; throat clean	2
C. *FOREQUARTERS:*	
Shoulder Vein, full.....	2
Shoulder, covered with flesh, compact on top; snug.....	4
Brisket, advanced; breast wide	2
Dewlap, skin not too loose and drooping..... ...	1
Legs, straight, short; arm full; shank fine, smooth.....	3
D. *BODY:*	
Chest. full, deep wide; girth large; crops full.	10
Ribs, long, arched, thickly fleshed	5
Back, broad, straight.....	6
Loin, thick, broad.....	5
Flank, full, even with underline.....	3
E. *HINDQUARTERS:*	
Hips, smoothly covered; distance apart in proportion with other parts.....	4
Rump, long, even, wide. tail head smooth not patchy....	5
Pin bones, not prominent, far apart	2
Thighs, full.....	4
Twist, deep, plump.....	4
Purse, full, indicating fleshiness.....	2
Legs, straight, short, shank fine, smooth.....	3
Total.....	100

JUDGING MUTTON SHEEP.

In the instruction in this direction, care was taken at the outset to instruct the student as to the proper method of catching, holding, and examining a sheep. As sheep must be judged

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largely by the hand and little by the eye, owing to the preparation that the wool generally undergoes, the handling of the sheep received special attention. A judge of sheep sees defects of form with his fingers and not with his eyes; for the trimmed coat of wool renders the latter organs very deceptive.

SCALE OF POINTS.— MUTTON SHEEP.	Perfect Score.
A. *Age*.....*Teeth*	
B. *GENERAL APPEARANCE:*	
Weight, estimated ....actual.. .....lbs. according to age.....	6
Form, low, long, symmetrical, compact.....	8
Quality, clean, strong bone; silky hair.....	8
Temperament,.....	5
C. *HEAD AND NECK:*	
Muzzle, fine; mouth large; lips thin; nostrils large.....	1
Eyes, bright, full.....	1
Face, short; quiet expression.....	1
Forehead, broad..	1
Ears, fine, erec t.....	1
Neck, thick, short	1
D. *FOREQUARTERS;*	
Shoulder Vein, full.....	2
Shoulders covered, compact.....	3
Chest. wide, deep	3
Brisket, projecting forward; breast wide	2
Legs, straight, short, wide apart, strong; forearm full; shank smooth.....	3
E. *BODY:*	
Back, straight, wide.....	4
Loin, thick, broad.....	3
Ribs, arched, deep.....	3
Flank, low, thick, making underline straight.....	2
F. *HINDQUARTERS:*	
Hips, far apart, smooth.....	3
Rump, long, level, wide.....	3
Thighs, full.....	3
Twist, plump, deep.....	4
Purse, full, indicating condition.....	2
Legs, straight, short, strong; shank smooth.....	3
G. *CONSTITUTION:*	
Girth, large.....	3
Skin, pink color.....	3
Fleece, dense and even over body, yolk abundant.....	4
H. *WOOL:*	
Quantity, long, dense, even.....	6
Quality, fine, soft, pure, even.....	4
Condition, bright, strong, clean.....	4
Total.....	100

SCORE CARD FOR SWINE.

When the time arrived for the scoring of hogs, the student had become skilful in applying the cards to other classes of stock;so that this part was completed with dispatch. The

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judging of beef cattle, mutton sheep and hogs have a number of points in common thus making the distinctive differences the only parts requiring special mention.

SCALE OF POINTS.—SWINE.	Perfect Score.
A. *GENERAL APPEARANCE:*	
WEIGHT, estimated ....actual.. .....lbs. according to age.....	6
Form, deep, broad, low, symmetrical, compact, standing squarely on legs.....	8
Quality, bone clean, hair silky, skin fine.	8
Disposition, quiet	5
B. *HEAD AND NECK:*	
Snout, medium length, not coarse.....	1
Eyes, full, mild, bright, large..... ..	1
Face, short, cheeks full.....	1
Ears, fine, medium size, soft.....	1
Jowl, strong, neat, broad.	1
Neck, thick, medium length.....	1
C. *FOREQUARTERS:*	
Shoulder Vein, full.....	1
Shoulder, broad, deep, full, compact on top.....	8
Breast, advanced, wide.....	2
Legs, straight, short, strong; feet medium size.....	4
D. *BODY:*	
Chest, deep, broad, large girth.....	10
Sides, deep, lengthy closely ribbed	8
Back, broad, straight, thickly and evenly fleshed.....	4
Loin, wide thick	3
Belly, straight.....	2
Flank, even with under line.....	2
E. *HINDQUARTERS:*	
Hips, wide apart smooth.....	3
Rump, long, wide, evenly fleshed, straight.....	3
Hams, heavily fleshed, deep, wide.....	8
Thighs, fleshed close to hocks.....	4
Tail, tapering.....	1
Legs, straight, short, strong; feet medium size.....	4
Total.....	100

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ADVANCED OR COMPARATIVE JUDGING.

As intimated the score card was used only as a stepping stone towards advanced or comparative judging. In the instance of mutton sheep and other kinds of stock where enough animals were available classes were made based on age and sex similar to the classes formed at all fairs and exhibitions. For instance, classes would be made of rams according to age and ewes would be shown in several pairs so that the student would become familiar with all the points that arise in the actual show ring. The same idea was utilized as far as possible in the judging of horses. This part of the work was the actual fruit of the score card training. Each student was required to report of his awards on a blank supplied to him in which he had to give carefully considered reasons. On this blank the student stated which animal he awarded first, second and third, and under each gave his reasons for so doing.

THE RESULTS OF THIS SYSTEM OF INSTRUCTION.

The outcome of this system of instruction extending over the past three years, has been that twenty of the students, who have taken it are capable of judging these classes at any of our county fairs. Some few of them have shown themselves able to do better than that but the most of them require the experience that comes with more practice. The winners of the Ogilvie gold medals are equipped for creditable work in some classes in the show ring of a state fair. As evidence of that it will be only necessary to say that when the students were examined last year in the competition for the medal, Mr. George McKerrow of Sussex, known as a successful sheep breeder over the continent, was one of the examiners of their work on judging seven different classes of sheep and his reference to it has been as follows: "One noticeable feature of the work was the systematic manner followed by all in a thorough and searching examination for mutton development. It was done in such a prompt, decisive manner as would put to shame many a self termed expert who blunders over mutton sheep at some of our state fairs."

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The draft horses last year were judged at the stock farm of Mr. H. A. Briggs of Elkhorn and Mr. Alexander Galbraith, assisted by Mr. Briggs, examined the students on their practical knowledge of draft horses. Mr. Galbraith has made the appended statement as to the character of the work done by the students: "I was particularly struck with the great care manifested by all the students in examining the essential points of the various animals and the generally correct conclusion come to by most of them. Taken as a whole, I should say that they evinced much closer discernment and showed better judgment than 75 per cent. of the farmers who have bought high priced stallions from us during the past ten years." As these men have made a life long study of the different classes of stock with which they have been connected their words are of more than ordinary weight.

THE RESULTS EXPRESSED IN FIGURES.

The competitions for the Ogilvie gold medal may be considered the test of the system and it would certainly seem that the markings of such examiners as those mentioned would be a true criterion of the practical merit of the students as judges. It will be only necessary to refer to the standings of the past two years. In 1892 the examiners were A. S. Alexander, editor of the Farmers' Review, Chicago, and professor of veterinary hygiene in the Chicago Veterinary College and Alexander Galbraith, then senior member of the firm of Galbraith Bros. The large stables of Galbraith Bros. and that of Messrs. Bowles, Hadden and Scott were used for the purpose of examination. Five classes of draft horses including one of fillies, one of Percheron stallions and three of Clydesdales of the various ages, with from four to six in each class, were used in the examination. Four of the students obtained from 70 to 74 marks out of one hundred and four others varied from 59 to 69. The students were examined in sheep at the farms of Mr. Geo. McKerrow and Mr. Geo. Harding & Son and these gentlemen acted as examiners. Nine classes of sheep with four to five in a class including Shropshire, Oxfords, Southdown and Cotswolds were judged. The percentage secured by the students varied from

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Judging draft horses in the competition for the Ogilvie gold medal.

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63, the lowest, to 77.7 as the highest. The average percentage secured by the students on both examinations ranged from 64.2 the lowest, to 71.8 the highest.

In the last examination, Mr. Geo. McKerrow, assisted by Mr. A. F. Noyes of Beaver Dam, examined the students on sheep at the farm of the former. Seven classes of Southdowns, Shropshire and Oxfords were judged, the Cotswolds having to be omitted as Messrs. Harding had shorn their sheep at that time. The horses were judged at the stock farm of Mr. H. A. Briggs of Elkhorn, who assisted Mr. Galbraith in examining the students. Five classes of Percherons including different ages and sexes were passed upon. In the examinations sixty marks were allowed for the correct placing of the animals and forty for reasons and in averaging the standing of the students in both classes of draft horses and mutton sheep 60 per cent. was allowed for the horse judging and 40 for that of the sheep. The average percentage of the six students that competed varied from 75.16 to 85.18 per cent. Such has been the result expressed in figures.

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INFLUENCE OF NATURAL CONDITIONS ON SHEEP.

John A. Craig, University of Wisconsin.

It is quite generally thought that only a certain kind of land —rolling in character, alluvial in nature and scanty in pasture— may be properly termed sheep land, but a study of the characteristics of the different breeds of sheep and their adaptability for different natural conditions verifies the fact that there are sheep suited for all the variations of environment that at present prevail. In this respect the position of the breeds amply illustrates the saying that "every bullet has its billet." While it cannot be asserted dogmatically that the breeds of sheep are only suited for the conditions that surround them in their native homes yet it can be claimed that they will do best when their circumstances approach those to which they have been accustomed. In discussing these features the aim is to indicate the cosmopolitan nature of the sheep as a genus, and, more especially, to supply reasons for some of the failures that have occurred through oversight of the influences that are enumerated. At the same time it is not sought to convey the idea that culture, resulting from the breeders' skill and intelligence, has been any the less effective in making progress or less successful in removing physical barriers.

THE WORK OF BAKEWELL.

Before the time of Bakewell (1726-'95) it is likely that the idea now too common with us, which limits sheep-farming to a small area, was then more or less prevalent in Europe. He won for the sheep a place in general and in high farming by making the production of mutton their chief end. The sphere of the sheep spread from the rough pasture range to the lower and more fertile fields until at this time they have adapted themselves to all the physical conditions existing in Great Britain. The breeder by working in harmony with environment has pro-

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duced and preserved small differences in type and many other qualities until there are twenty-five recognized breeds of sheep in Great Britain, while we are slowly freeing ourselves of the idea of a single kind of soil and a single system of management for all sheep.

THE INFLUENCE OF ALTITUDE.

The three things requiring consideration in discussing the adaptability of sheep are those of climate, soil and food. These in turn are decidedly dependent on altitude, and this again in England and most other countries is determined by the geological structure which gives the island its shape. The geological strata, whether hard and element resisting or soft and decomposable, exerts an important influence on the altitude or the height above the sea. High altitudes are associated with broken, rocky regions, with more exposure than pasturage, wheras the opposite brings to mind the fertile lowlands of alluvial soil and luxuriant vegetation.

SUITABILITY OF THE BREEDS FOR DIFFERENT ALTITUDES.

With the altitude as a basis it is possible to arrange the breed so as to illustrate the wide variation that exists in their characteristics and at the same time supply a general key to these.

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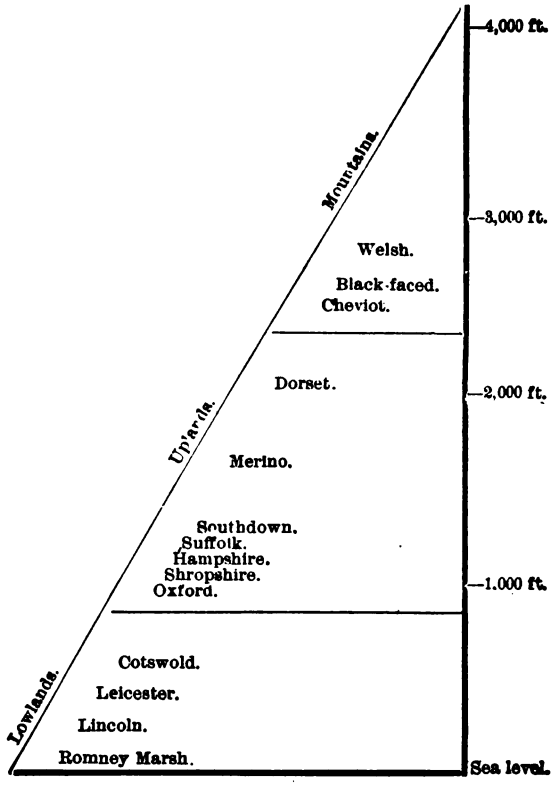

As the grazing grounds of the breeds rise in altitude there are variations in type, size, wool and many other attributes to be noted. The Romney Marsh, where the sheep of this name is reared, is stated to be a plain of rich soil, drained by wide ditches, and so near to the level of the sea as to require the protection of walls. Notwithstanding this it is stated that there are more sheep kept there than on any equal area in Great Britain. From this the first rise brings us to the Cotswold Hills, with an average altitude of 500 to 600 feet, and it is asserted that it is only upon hills not exceeding 900 feet in perpendicular height above the level of the sea that the Cotswold sheep will flourish. Above this comes the Downs, which have frequently been likened to many of the western states. Higher still between England and Scotland are the Cheviot Hills, which chiselled from igneous rock rise in places 2,700 feet above the sea. Above this is the home of the Black-faced Mountain sheep,

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a cateran of heath and heather proclivities, and again up are the homes of the Welsh and Wicklow mountain sheep that have been observed feeding at an altitude of 3,200 feet on the side of Ben Nevis. The highest grazings that sheep have been known to reach is reported to be in Peru on the plateaux of the Andes, which range in altitude from 10,000 to 17,000 feet, and this gives a constant temperature and a fleece that is always growing.

Marshall gives an apt illustration to show the natural inclination of the sheep when they are left to themselves in making their choice. He tells of an instance where Lincolns and Downs were kept on a farm that was made up of land that differed in character. When they were turned out the Downs would go to the dry upland and the Lincolns would seek the marshy bottom land.

THE POSITION OF THE MERINO.

There are likely some anomalies in this arrangement submitted, but the only one space allows to be noticed is that of the Merino. The Merino is beyond question the citizen of the world among sheep. No breed of sheep has passed into all countries and thriven as the Merino, and in addition become so closely in touch with their environment as to become the progenitors of native families. This would seem to be due to the migratory habits that are forced on the Merino in Spain, where the flocks are driven toward the north in summer and southward in winter and thus inured to all the variations of a diversified country. Yet in the arrangement shown it is indicated that the Merino is confined to a prescribed area, which is not the fact.

DIFFERENCES IN BREED TYPES.

Type being one of the most peculiar features of the breeds it is interesting in this connection to indicate its bearing on the sheep adapted for different altitudes. It can be said that each breed has its peculiar type and within them are the family types that are characteristic of the flocks of each breeder. It is the former when not due to culture that reference is made. In nature it is produced by function under the untrammeled action

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of natural conditions. Among the mountain sheep—the Black-faced Mountain, the Cheviot and to some slight extent in the Dorset—there is an approach to the wedge shape with an extra strong loin and the long hindquarter expected in a sheep that is required to do much climbing as the price of its subsistence ..ne circular form that all the Down breeds have more or less as their characteristic is quite distinct from the squarer-framed and heavier bodies of the large white-faced breeds, and while the former represents quick-fattening with a maximum amount of activity in obtaining food the latter type is the most favorable for slower and much heavier growth. Closely connected with type is the influence of altitude and its attributes on size. The gamut runs from the Lincoln, the mastodon among sheep, to the smallest of the mountain sheep that prefers to have its "ribs less rich" that its battle with stern conditions may be more surely won.

ADAPTIBILITY OF THE BREEDS FOR DIFFERENT CONDITIONS.

The Lincoln or the Leicester would not long retain their mammoth proportions without the infusion of fresh blood if forced to graze the rugged glens of the Great Cheviot that rises 2,676 feet above the level of the sea. And it is even less likely that the Cheviot would retain its pertness if confined to the level lowlands. While inspecting a flock of Leicesters kept on a hilly and high farm the proprietor spoke of the difficulty in keeping up the breed type, even though much fresh blood was used; and in conformity with the general opinion on such a matter he had decided that some disease was among them. It was good sheep land according to the usual conception of such. Here is a counter illustration: On the lowest land that is likely to be found on this continent, that of Prince Edward Island, the handling of the Leicesters there, as carefully as a judge is compelled to examine them, convinced me that they were the best-fleshed and aparently the most thrifty sheep that I ever had the privilege of closely scrutinizing. This was on land that current opinion would condemn for sheep. The dark-faced breeds, though known to me to be from some of the best flocks in Canada, had

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dwindled in a single generation under the same conditions. The Cheviots I have seen lose wool, heart and thriftiness under conditions adapted for the heavier breeds; and yet the same characteristics that lead to this are identical with those that make them the champion graziers of rough and exposed pastures. I have been told by proprietors of highly cultivated pastures that they found the Southdown did not do well with them because the ewes grew too fleshy and gave birth to weak and soft lambs. The sheep were out of harmony with their conditions or else the management was otherwise at variance with the traits of the breed. Mr. Thomas Ellman is on record as saying that so great is the influence and effect of climate and soil that the fine flavor of the Southdown mutton may be changed in time to the coarse, tallowy meat of the Leicester or other long-wooled sheep; and he further adds that not only the flesh but the wool and every other featrewill become assimilated to those of the different localities.

It is an inexhaustible subject to discuss in detail the influence of climate, soil, and food on wool. Hair is the greater part of the covering of the sheep in a state of nature and wool is the result of culture and good treatment; hence its susceptibility to influences. Climate is considered to have an inflence on density, the colder the climate the denser the fleece. The fact that sheep of the eastern counties of England have bare heads while those of the midlands and west are covered has been mainly attributed to climate. On the other hand extreme exposure and poverty of soil are credited with much of the kemp or dead hairs that appear in the fleeces of some sheep. The superior purity of the Australian wools, their softness and lightness and luster, are attributed to the climatic conditions of that country. Dr. Bowman considers that a given temperature and a certain amount of moisture are necessary for the retention of luster and cites New Zealand wool as illustrative of this quality. Luster is associated also with clay soils and harshness more or less with those that are chalky.

INFLUENCE OF FOOD UPON WOOL.

The quantity and coarseness is decidedly a question of food. The variation extends from the Lincoln with heavy and compar-

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atively coarse fleeces and rises gradually to the light but exceptionally fine-fibered wool of the Shetland. The latter has been world-famed since 1791 for the wool entering into the composition of shawls that can be passed through a finger-ring. In figures the variation may be expressed by saying that a fiber of fine wool is 1-5,000 of an inch in diameter, while a coarse fiber will be 1-450 of an inch. It was Bakewell's opinion that rich pastures had to be overstocked to grow fine wool. Abundance of food makes heavy fleeces that get their weight mostly from grease and to some extent from the length and size of the fiber. The complaint is not infrequent among some breeders that they are not able to maintain the weight of the fleeces of their flocks. More food will keep it up, or if that cannot be supplied economically a smaller sheep would be better for the circumstances and likely more wool could be produced per acre. Bakewell considered that a clay soil was the best for wool-growing and that sand was next, with lime last, and it is likely that the general opinion of today among flock-masters would endorse his position.

EACH BREED HAS A PLACE.

Such allowances for the influence of natural conditions enable one to understand what are impediments to success and what are not, and they should certainly prove the fallacy in considering that sheep can only be kept with profit on such land as comes under the common description of sheep land. On the other hand the truth expressed by Emerson, to the effect that "the physiologist has observed that no creatures are favorites but certain compensations balance very gift and every defect," should induce those that are interested to make a special effort to retain the traits of the different breeds and confine them to the sphere under which they will yield the most profit.—The Breeders' Gazette.

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Students scoring Cotswold sheep from the University flock, with the score card, for mutton sheep

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OUR COUNTRY SCHOOLS.

J. M. True, Secretary.

We are inclined, as a people, to boast of our public schools. They are commended to the popular estimate because of their availability, being alike open to all classes and conditions of society.

The child of poverty and social restriction stands upon the same plane with the more fortunate scion of wealthy and aristocratic parentage.

No other institution of our government to so full a degree illustrates that grand old declaration of rights—that "all men are created equal."

Grand in its inception, but grander in its results, our common school system is entitled to our sacred guardianship, and most loyal and generous support. Upon its success is based the general intelligence and business capacity of the masses, and from its inspiration come the strongest and most illustrious characters in science and letters.

By its elevating influences dull plodding minds are quickened to thought and action, while genius shakes off the fetters of unfortunate surroundings, and goes forth into the fields of higher thought and broader research.

Do we appreciate the influence, the worth and the importance of our common schools, or have we from their very commonness come to forget their merit, and to neglect their proper encouragement and support?

I wish briefly to speak of the conditions and requirements of our country schools, also of some of the dangers that threaten their usefulness.

It has been a pleasure to me to be from my early youth almost constantly identified with our schools either as pupil, teacher or school officer, and though the experiences so gathered are as varied and diversified as the different parts of the country, where they were met, they have demonstrated that in all places, and

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under all circumstances the public school may be taken as an indication of the intelligence, breadth, and character of the community where located.

Why do we frequently find a single school in a township that in point of scholarship, deportment and general high qualities outranks all districts around it?

It is always spoken of as the best school in town. This standing is not gained because of the greater natural capacity of the pupils, but results from the intelligent and open-handed appreciation of what makes a good school on the part of the citizens of the district.

The school house is well located. Its surroundings are pleasant and enjoyable, not to say beautiful. The fences are neat and unbroken. Trees and even flowers, in their season, are tolerated within the yard. The school building is pleasing and even tasteful in its external appearance, and within is roomy, light and cheerful. The seats and desks are easy, convenient and neat, and the walls of the room are covered with pictures, maps and ample blackboard surface—and ample here means all there is room for.

Proper and complete arrangements have been made for warmth, ventilation and the exclusion of the direct rays of the sun. In short the plan is adapted to the performance of good work, and in it good work is required and appreciated.

The requisites of a teacher in this position are: Adaptation to teach, experience in the work, education, and moral worth. Each in itself excellent but not alone, nor in conjunction with less than the other three qualities, the full measure of a successful teacher. The district that has so far recognized its educational interests in providing room and teacher, will encourage and support both teacher and pupils by frequent visits to the school, and by an expression of approval when deserved.

Under circumstances like these the best elements of the child's nature are developed. His education and his character are influenced by his orderly surroundings. He respects his work, his associates, his teacher and himself, and steadily but naturally develops into manhood.

In too many of our rural districts the conditions surrounding our schools are quite the opposite of those already enumerated.

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A want of appreciation of educational worth pervades everything, while penuriousness and narrowness overshadows every movement.

To illustrate—the cheapest piece of land centrally located in the district, though unsightly and even unhealthful is selected for a school house site.

Upon this is erected a building, inferior in taste and finish to many of the barns and granaries in the district. The room is too small for the work required. The seats are rough and hard, illy adapted to the various sizes of pupils.

The room is cold and much time is lost and confusion caused by the efforts of pupils to warm themselves around the shattered stove.

The walls are bare and smoky and available blackboard surface meager. The windows are curtainless, the doors sag upon their hinges.

To maintain a fair school in such a room would require the best material in a teacher, for the pupils are here influenced by their surroundings. The place suggests idleness, mischief, coarseness and impudence. But who is selected to teach this school? The young teacher who has gained a permit to teach upon an examination for a 3d grade certificate, applies for the position, offers to "keep" the school for wages satisfactory to the board, and is accepted. The question of mental fitness or moral worth, cuts no figure in the transaction. They want a cheap teacher. The patrons of this school never visit it unless to scold the teacher or complain of offending pupils.

They growl at rumors reflecting upon the teacher's work, and are glad when the term of school ends.

Most of our common schools find their true position somewhere between the two illustrations presented, but in far too many the tendency is to gravitate toward the bad. Our country schools are not keeping pace in advancement with the requirements of the times. We are doing better work upon our farms. Intelligence goes hand in hand with labor. Improved machinery is called in to aid in promoting good work. Better farm stock is crowding from or fields and stables the inferior animals of the past.

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To do fairly well no longer satisfies, we aim to excel. But how are our schools?

Do better farm buildings suggest better school houses, better methods in farming, recognize improved educational methods, better fitted and better paid teachers. Better appliances upon the farm a better equipped school room, and better colts and calves, better educated, broader-minded and better-mannered boys and girls?

To promote the interests of our schools, the best men in each district should be selected as school officers. Procure the best of teachers, and keep the good teacher as long as you can. Better work can be done with each succeeding term. The great drawback to our country schools is the youthful and ever-changing character of its teachers. That young man or woman who makes teaching a mere stepping stone to some other position in life seldom does the best work. Good, experienced teachers are not abundant. The estimate and treatment of the school teacher by the average district board does not have a tendency to popularize the work as a life vocation. There should be a recognition of adaptation to work, and promise in young teachers—shown in kind expression and increased wages—since only by a recognition of good qualities in the inexperienced can give us the fully developed excellencies in the older teacher.

As I have already stated our common schools are for the education of the masses. They are the colleges from which a large per cent. of our boys and girls go forth to life's work, and for the sake of this class especially I plead for good work.

With the excellent high schools now maintained in our larger villages and cities, and the universities and colleges just beyond, liberal education is receiving a healthful and encouraging impetus.

These privileges are easily attainable to the children of the wealthy, and possible of attainment to the children of the poor, but let us not, as I know is often the case, allow the standard of excellence in the common school to be lowered because these higher advantages are within our reach, since by so doing we deprive a large percentage of the pupils in our district of the benefits of superior instruction in the last terms of their attendance at the common school.

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I am glad that the sons and daughters of farmers are so largely represented at our high schools and colleges. This is as it should be, and while I would magnify the claims of the common school, I would not seem to underestimate the importance of a higher education.

But as an American institution let us foster in its best form our common schools, where free from the narrowing influence of sectarian thought, in the language of our country, all our children may be early taught correct ideas of manhood and womanhood, realizing that the intelligence and morality thus inculcated are the best safeguards of a free people.

FATTENING LIVE STOCK.

Dr. E. M. Rogers, Hartford.

Mr. Chairman; Ladies and Gentlemen:—When you undertake to feed an animal for fattening or any other purpose, I think that it is of paramount importance to have some knowledge of the digestive organs of such animals, some knowledge of digestion, assimilation and nutrition of the different kinds of food to be fed to the animal. Cattle after nearly the age of maturity have four so-called stomachs through which the food fed to them must pass before assimilation can take place. The first is merely a receptacle where certain kinds of food are lodged temporarily until such time as the animal can have an opportunity to ruminate or chew the cud, after which the food is swallowed and passes through the other stomachs for its final disposition. The rumen or first stomach, is supposed to empty itself of its contents about every six hours; and now an important, practical question for us to study, is how can we feed grain and other food so as to have it well ruminated or re-chewed before its passage to the other stomachs. I think that it is a well settled fact, that if we feed alone ground grain, or even whole, it will not be

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well ruminated for the reason, the food is not in proper shape for the first stomach to throw it back to the mouth for re-chewing; but if we feed with the grain some coarse, rough food, such as ensilage, timothy or clover hay, corn stalks, or even straw, it mixes with the grain and makes such a bolus as to be far more readily brought back to the mouth to be again properly masticated. A practical point for us to know in the process of this digestion of food, is that after such food has first entered the rumen, a suitable amount of water is needed by the animal, putting the food in far better shape for rumination, for it is a well demonstrated fact that no gastric juice comes in contact with this food until it has reached the fourth stomach.

Another matter of no little importance to us in feeding is to know the chemical value of the different kinds of food used in feeding and fattening our cattle or other animals.

All fodders or feeds are made up of two principal elements. 1, water; 2, dry matter. Dry matter is what is left after the water is removed, and consists of two principal elements: mineral and organic matter. These two elements cut a great figure in the makeup of the animal and for our practical purpose in this paper we will classify them under two heads, protein and carbo-hydrates. Protein includes all parts of food which contain nitrogen, and we know that the make up of the muscular tissue and bones of the animal contain nitrogenous substances, consequently protein is an invaluable element in food. Carbo-hydrates is that kind of food that contains starch, sugar, etc., and is composed principally of carbon, hydrogen and oxygen, and is of the greatest importance in nutrition, for it produces heat, and also fat and some other constituents of the body.

We will now examine some kinds of food for their chemical composition. There are some kinds of food that are very rich in protein, but are so expensive that there would be no economy in their use, so we will not recommend them here. Green pastures have in each 100 pounds, two and one-half per cent. of protein and ten and one-half of carbo-hydrates and a small amount of digestive fat. Corn ensilage is poor in protein, but has over thirteen per cent. of Carbo-hydrates. Clover hay has six and one-half of protein and thirty-four and one-half carbo-hydrates. The oil meals are rich in protein and consequently

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are very valuable as foods, except that they cost too much to be used with economy. Wheat bran, a food that we can afford to use as regards cost, contains twelve and one-half per cent. of protein and forty-four of carbo-hydrates. Indian corn has seven per cent. of protein, sixty-two and one-half carbo-hydrates and four and one-half digestive fat. Now having given you the chemical value of the different kinds of foods, the next question is how to feed this food in an economical and successful manner.

I would like to say right here before making any suggestions about feeding, that there is another question of great importance to the feeder in the successful prosecution of his work, and that is, the kinds of stock to feed. It is a fact that you all know, that cattle of the same age and size fed in the same manner, do not thrive alike; that they may eat the same amount of food of the same kind and all of their surroundings the same, but they do not fatten alike. Now why is this so?

It is a difficult matter to give the physiological reasons for this condition, but that there is a something in the make up of the animal producing this difference, there can be, and is no question. I have searched in vain the literature upon farming and the feeding of animals to find some explanation for this difference. Nutrition cuts a great figure in the whole human and animal economy, in fact, it taxes the best research of the physician to adequately understand this function so as to apply it successfully in ministering to the repair of the human subject as a result of disease. And in fact, mal-nutrition and mal-assimilation are subjects for our daily study; also bad nutriton often exists where we find no evidence of disease. Nutrition, as applied to the animal, is a function that has for its successful performance several factors. One is that the animal has a vigorous circulation of the blood, with a strong muscular heart with blood vessels and capillaries in a similar condition. Another factor, and one I think of some more importance than the above, is the development of the nervous system. It is a well known fact to the physician that where we have from any cause deficient nerve power or nerve force we have atrophy or loss of muscles and fat, as a result; a paralyzed limb will certainly grow smaller although the circulation of the blood remains the

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same. Nerve force or nerve energy is not the same in every individual; as a matter of fact, the brain is the head center of all nerve force or power and I believe it to be a fact that cannot be controverted that the better the brain is developed the more so-called intelligence possessed by the animal, the greater will be its nerve force, for the important object of increasing the vigor of the circulation of the blood, of increasing the powers of digestion, assimilation and nutrition. The subject of nutrition and assimilation of food is one on which chapters might be written but I have simply suggested the cause that seems to me the reason for the difference that we find in different animals to utilize the food given them.

You will now very properly ask me the way to remedy this difference in animals. I will undertake to answer the question as well as I can. To illustrate what I want to arrive at, we will take the Jersey cow. The Jerseys, as you all know, are natives of one of the Channel Islands, called the Isle of Jersey. They have been bred there with much care for very many years and their breeding seems to have had one special purpose in view and that is milk and butter. Now we in this country are quite familiar with the characteristics of that animal, for they are now quite numerous here. We know very well that they are possessed of a very high degree of intelligence; that their nerve force is remarkable and strong. Now I believe it to be true that none have been bred longer and more intelligently than the Jersey and their breeding has been in a certain line, that is, for milk and butter, and the success attained by such long continued breeding you all know. Now it is a well settled fact that in persistent and intelligent breeding similar results can be obtained in other lines. If it can be obtained in producing more milk and butter fat in one class of animals, it can most assuredly be obtained in producing an animal which can better assimilate its food for the purpose of making, economically, beef, etc.

We have given you the chemical feed value of such food as you can have on your farms or can obtain, for feeding stock, and now we will undertake to give you an opinion as to how best utilize that food in fattening stock.

It may be asked, at what age would it be advisable to begin

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feeding an animal for fattening purposes. You will find much difference of opinion among farmers on this subject, but it is my opinion and that of many others, that the animal from its birth should be fed so liberally as to keep it constantly growing and fattening, and if this is done, when the animal is one and one-half years old it will not be profitable to keep it longer.

Some of us farmers feed stock that we do not rear on our farms, but purchase as best we can when we get ready to feed in the fall and in most instances are compelled to purchase animals that have not been treated as well while young as they should have been, and in this case I would prefer to have an animal past two years old, as I am convinced from experience in feeding such stock that they will make more profitable gain than when fed younger.

The farmers in this section of the country when feeding for fattening purposes, usually do it in the winter months, and in this cold climate it is quite important that we have a suitable place in which to keep our stock. We must have an apartment or apartments where the temperature is kept much the same. We must have good light and ventilation. It needs no argument to prove that if our animals are subjected to sudden changes of temperature, especially cold, that an excess of food consisting of the carbo-hydrates, is needed to maintain animal heat and consequently is a loss to the feeder.

I prefer when not having too large a herd to tie them in stalls as they are far more quiet and cannot disturb each other as much as when allowed to run loose together. Another important reason for having them tied, is that we can have absolute control, and knowledge about the feeding capacity of each animal, and that the food of each animal can be controlled by the judgment of the feeder.

I would prefer to have water in the barn so that it will not be necessary for them to be exposed to cold, chilly winds and also to drink too cold water.

Now we come to the last part of our subject, which is how to feed our animals so as to be economical and to procure the results desired.

I have already hinted at the chemical composition of the ani-

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mal to be fed and also to the constituents of the food to be used in feeding our animals. You can all readily understand that if we feed in excess food that contains too much of what we call Protein, which I have told you goes to make bone and muscle; that we are not producing a good result, and on the other hand if we feed too much Carbo-hydrates we are again at fault. Practically, you farmers know most of you how to proportion the different kinds of food so as to produce a fair result. We must study with great care the different chemical elements in these different kinds of food so as to produce in the animal what I would call harmony or in other words give a well balanced ration.

We must have as one of the essentials in the ration something rich in carbo-hydrates, and that can best be had in Indian corn as we have found that in every 100 pounds we have 62 1-2 carbo-hydrates or fat-producing element. We must also have for reasons already given some rough compound such as corn ensilage, clover hay, etc., and also something containing protein and we have that to some extent in clover hay, and also a food not so coarse as clover hay wheat bran, which is to quite an extent made up of protein substances.

Another feed of great value because it contains more protein than almost any other feeds, is the oil meals. The only objection to its use is the price asked for it, as economy in feeding must always be a prime factor. I do not propose at this time to give you any specific amount of these different kinds of feeds that you should give each individual animal, but you must study the question in a practical way, and use your own best judgment in the premises.

I regard corn, corn-ensilage, clover hay and wheat bran as practicably containing nearly all of the essentials fed in proper proportions, as being a fairly well balanced ration. Corn ensilage, although not being an essential as a feed, I regard as one of the very cheapest rations to be had on the farm, containing as it does a large amount of the carbo-hydrates; being very succulent and easy of digestion. I would recommend that the stock be fed three times a day, for we find that the rumen or first stomach empties itself once in every six hours, and I regard

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it as good policy not to keep that stomach empty for too long a space of time, nor too full for an unreasonable time. As regards the specific amount of food to be given to any individual animal, if any farmer desires my views upon the matter, I shall be only too glad to try and answer any question that he may ask me.

FACTS ABOUT THE SILO.

By H. M. Culbertson, Medina, Wisconsin.

When I began farming for myself it was on one-half of the old farm home, where I had spent all but three of my 24 years. The old farm with its out-stretched arms had always been homely enough, and like most others, was productive enough; but I had never liked farming.

Farming was confining. It asked for all one's attention. It demanded that the spending money be at home; and these things bother boys most.

Boys want investments which flung to the winged winds grow themselves into—well they never become fortunes, but disappointments.

About two-thirds of the usual number of cattle was kept while the larger portion of cleared land lay beyond a newly established line fence; and the second year called for the solution of the problem — how to keep the cows producing milk in winter without buying hay again, which consumed the little margin?

That year the first piece of fodder corn the farm ever grew, solved this problem. The facts were easily combined and results noted, and were the beheader of the old hay process farming. But the winter management of this fodder was still an unsolved detail until the silo was built and the corn stored in it.

This was a success in every way. It was a kind of labor we enjoyed, as we could each time begin just where we left off.

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Nothing to be done a second time as in hay making when the cured hay becomes wet by the rain causing a repetition of all our labor in drying it after it has lost that quality to keep up those few pounds of milk, the profit; and secondly, farther than producing a ration costing five cents less per cow daily than hay, it produces more milk with grain food equal.

How could we help feeling enthusiastic and saying in our first paper on ensilage in 1887, "The silo has come to stay, although a few may be abandoned, and he who follows the example will profit thereby."

I have given what led me to build a silo, and the results by one with limited capital; but you ask, "Are you still satisfied?" I will tell you. I selected two cows for a test, one had given milk 34, the other 4 weeks.

The daily ration per cow was 8 pounds peas and oats and all the corn ensilage and hay they would eat. The hay was of extremely fine quality, early cut second crop June's grass and clover cured thoroughly without rain. The feeding periods were six days each, and during the first, the ensilage, they gave 266 pounds milk, 11.95 of butter. The second, the ensilage was not fed. They gave 238 of milk, 10.52 butter. The third, the first ration was repeated and they gave 259 pounds of milk, 11.85 pounds butter.

As a rule silos are found only with dairymen who follow the winter production of milk. Why? Because they have studied their business and comprehend more fully the necessity of reducing the cost of production, and keeping each cow producing that last pound of milk. If you feed your cow liberally of a succulent food and she produces 25 pounds of milk when with a fair ration she would have fallen to 22, you may not possibly get enough more milk to pay for the present extra food, but in weeks to come, when she would have fallen to a dozen pounds and you possibly have held her near the twenties, starting with this into the summer with the cheapest and best ration, if there is any profit in feeding that cow for the production of milk that extra food will have brought it to you.

Necessity, the mother of invention and progression, has crept into the dairy man's intellect, and he sees, that being in the

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field with a host of competitors he cannot look for high prices, but his profit must come by reducing the cost of production.

The silo is his resort. It retains for winter the natural succulence of plants which through the unseen make up of the animal, artificial conditions cannot supply; and places within his reach, crops producing abundantly, allowing him to keep fifty per cent. more stock on the same acreage.

Young men are today taking the old farms at high figures. They necessarily expend more money in various ways than their fathers did when they started for themselves, at the same time they cannot hope to receive as high prices; thus the matter resolves itself at once into the cost of production, and true farm economy.

There perhaps is no branch of industry which affords so many channels of loss as farming; and he who can carry all these lines to success must possess wonderful ability in that respect. It is not one line of business, but many. The manufacturer has his superintendent for each, and to follow up all these, tuck in the ravelings, stop the leaks, at the same time lead and be watchful of the advance guard, makes us weary.

In the cities we find men singled out in business, each taking some specialty, and the half and quarter cents are their profits. In our business as producers these cannot be so readily estimated; but too many lack the backbone, energy, the grit to stand up and face their battles as nature wants they should, and becoming despondent leave the noblest, the most independent calling on earth, move to the city and be somebody's chore boy, or sit on a dry good box and whittle.

Nature's old soil is begging for occupants, yet it cannot use those who sit down and await the profits while the pigs and feed are kept wide apart.

There is no industry affording so wonderful a field of study as the farm; natures own study, the first of all; boys stay under the wing of the old farm, dig out the life of usefulness which awaits you within all its extreme surroundings and conditions, for its capabilities are characteristic of broad-minded and useful men.

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Old time hit or miss farming must run ashore and be replaced with systematic work. Education must be depended upon; this means thorough investigation and carefully based calculations; and as no one being is master of all, drift to specialties and excel in competition.

There are too many stock growers complaining today of low prices and hard times, while their own systems are extravagant, and works wasteful.

There are corn stalks enough on many farms thrown into the yard annually and trampled to waste, which if properly preserved would winter a large portion of the stock and in a better condition than they now are, and would cost practically nothing, as the land now devoted to hay, in some other crop would soon exceed the cost of corn produced.

It is not reasonable to expect that any great portion of the stock growers will soon operate silos, yet the usefulness of the system is a well established fact. It is not, dare we chance it, but adapting it to one's conditions. Formerly all followed one formula; today each has his own.

First, we looked for the greatest quantity per acre and heavy feeding; today what our judgment determines, quantity and quality; and when one begins operating a silo, it means more interest invested in his business, causing more and better thought, and the majority of winter milk producing daries cannot afford to continue without one.

Corn is mainly the crop because of the greatest quantity per acre, and difficulty in handling in any other way as satisfactorily.

Clover also may be excellently preserved, but the ability to cure clover into hay, and some dry bulk food needed, and corn ensilage and clover hay making so complete a bulk ration, corn remains the prevailing crop.

I have siloed corn in various stages of maturity, and that containing the least moisture yet sufficient to insure preservation has the best flavor. In this connection, corn may be husked on the hill just ahead of the cutter and cured in the field in the average season, which enables me to put my crop just where I want it for if the grain is siloed dry cows and young stock get in

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when the hogs are more needful of it; and corn ensilage without the grain, and clover hay, make an excellent food for breeding ewes. If the grain is needed in stock feeding, of course silo it, as none scarcely passes whole, therefore we suppose it digested, saving the expense of husking, shelling and grinding.

Little moisture in the stalks when siloed makes the process more subject to loss, therefore do not recommend it to beginners. If there is a lack of moisture, cutting short is advantageous enabling better packing.

Uneven distribution of moisture is sometimes a cause of mould and may be guarded against.

A deep silo, other dimensions small, is preferable, packing the contents more solidly.

A small surface exposed is a great convenience in feeding in winter, as frost bothers less; in summer, as less surface has less decay; and with little moisture, as the high temperature causes much evaporation and consequent damage.

Corners in silos are objectionable, but a stick of square timber ripped diagonally, set upright in the corner, not a plank nailed in to warp and afford a ventilation chimney, and care taken in filling very little if any loss need be expected.

My silo, 12x14 feet inside, would be too large for 24 head of cattle for the best results when ensilage contained very little moisture.

The best covering I ever found was wet sawdust. Whatever the covering be let it be wet, and as the moisture lacks in the crop siloed, let a proportionally greater care be taken in covering, when some weighting also pays.

No industry is all sunshine, and that done best, succeeds best.

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ELEMENTS OF SUCCESS IN SWINE HUSBANDRY.

R. E. Roberts, Ives Grove.

With the large packing establishments so near our feeding pens, and with the facilities and ease of getting our swine to these establishments, to be manufactured into products to be distributed throughout the markets of the world, there is no live-stock industry more lucrative to the farming community, than swine husbandry.

Still there is no branch of farm industry that requires more study, care and attention than the management of hogs. Of the first importance is the selection of breeding stock.

I shall not advise you what breed to select, but be sure that they are well bred, of good growth and general form, good girth around the heart, and low brisket, broad strong back, broad across the loin, legs well set apart, ribs well sprung up and out.

A quiet docile disposition is very requisite in a good motherly sow.

The male should have all the characteristics of the masculine nature, should be blocky, not too long.

The next important point is the feeding and caring for the stock.

We raise so much and such a variety of hog feeds and yet it is so easy to throw corn to the hogs, and let them get water from a pond, that we are apt to adopt this as the way to raise our growing hogs.

All breeding, and young, growing stock should be fed very sparingly on corn. A mixed feed or variety of feeds for them is much the best.

If you want good health, good muscular development, good size and vigor, feed oats, bran, shorts, beets, a little oil meal, with potatoes, and turnips, for a change. This kind of feeding tends to develop them much better and faster than a corn diet. About as good a feed as we can get is bran, shorts, and ground oats, add a little oil meal and feed twice a day with a small ra-

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THE OGILVIE GOLD MEDAL.

Awarded annually to the student showing the most skill in judging draft horses, and sheep of the mutton breeds.

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tion of corn. Let the hogs have access to a mixture of ashes, charcoal, and salt. The water that we mix the feed with should be warmed in freezing weather.

Sows should farrow at a time when the pigs will have the best and surest chance of living.

That time would be, in Wisconsin, the last part of April and during May.

The pigs usually make by fall as much growth and in some instances more than early March and April pigs, for the reason that the early pigs often suffer from cold and wet weather, thereby checking the growth.

The shortage in litters saved is much against early farrowing on most farms.

A few days before farrowing the sow should be separated from the others and allowed a place to run where she will not be disturbed. Her feed should be light for a few days before and after farrowing.

I have found bran and a little oil meal the best feed for this time.

If properly fed at this time she will not eat her pigs, and will be less restless and liable to lie on them.

Her farrowing place should be warm and dry. But little bedding should be given and this in such shape as not to entangle the pigs.

If the weather is cold, it is necessary that we be present and as soon as a little fellow comes to light, dry him off and see that he nurses.

In order that our brood sows may be quiet, we should at all times treat them kindly.

Here is the time many a good sow and litter of pigs are ruined by a mistaken kindness or lack of proper knowledge of how the animal should be treated. She should have only a little water the first day, after farrowing. The second day a little bran may be added.

She should not have any grain for at least three days after farrowing.

As the pigs grow, they draw more heavily on the sow, hence the sow requires more feed as the pigs grow older, until she is fed all she can eat.

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As soon as the pigs are old enough to drink, an extra side pen should be fixed for them close to the feeding place of the sow where she cannot go. Here they should be taught to drink by placing a little sweet milk in their trough. They will also soon learn to eat soaked corn, oats, and shorts or bran. As the sow beings to lack in milk for them, we can make it up by feeding them in this way thereby keeping them growing without any check, which is very necessary. Their pen should be kept at all times sweet and clean to avoid scouring.

The young pigs should be pushed from birth to maturity.

Feed during growth so that when matured a very short heavy feed will be necessary to finish for market.

But while the pigs are growing it will be quite an item to secure this growth at as low a cost as possible.

One of the cheapest of all feeds is grass, and while a very good growth can be secured with other grasses my experience is that no kind of grass will equal good clover.

It is not best to rely upon grass or clover alone. A little grain should be given in addition.

Slops made from a mixture of bran, shorts, and ground oats, with a few ears of corn given daily, is a good addition to grass.

They should be supplied with pure water from wells, and never permitted to have filthy water to drink.

Feed three times a day.

The same amount of food given in three portions is better than given in two. My experience is that it pays well to make an effort to feed and water stock regularly at the same time each day. Never feed more than is eaten up clean, as pigs prefer fresh feed.

A good trough and feeding floor is very essential so as to lessen the waste. Do not pour slop in the end of the trough, as the stronger pigs get the most and the richest.

Feeding cannot be done successfully at noon in the hot season unless there be shade provided where you feed.

Success belongs to those who watch, think and carry the pail.

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THE FEEDING OF COLTS.

John A. Craig, Wisconsin Experiment Station, Madison.

To answer the inquiry of a correspondent as to the proper ration for a colt it will be only necessary to cite the management that is the practice of the most successful horse breeders, for it will be found that there is hardly any variation in the methods that are followed.

GRAIN FEEDING BEFORE WEANING.

There is no questioning of the fact that it pays to feed colts grain before they are weaned. The greater growth and strength of a colt so fed justifies the practice, and it is also specially effective in preventing any check to the colt's growth when it is being weaned. When about a month or two old the colt will begin to eat grain with a relish, and it is none too early to begin to feed it at that time. The best grain for colts at that age is assuredly oats, either ground or scalded. The feeding of corn is not advisable. It will make the colt look smooth, but it is certainly not conducive to growth.

If the colts have been dropped at the customary time in the spring, a good way is to arrange a feeding place for them in the pasture field. A feeding place may be easily arranged so that the colts may pass in to get their grain but the mares can not get at it. By feeding both together for a time the colts become accustomed to visit this place for their food and then do not hesitate about going into it alone.

QUANTITY GOVERNED BY INDIVIDUALITY OF COLT.

The quantity of oats that may properly be fed before weaning is dependent on the individuality of the colt and also on the extent to which its dam is milking. A loosely built or lanky colt with every indication of making rapid growth will utilize with benefit all that he can be induced to eat; while the short, thick

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set individual will fleshen on a much smaller amount. But the condition of most importance is the milk flow of the dam. The aim should be to supply enough grain food to supplement the mother's milk, so that the colt will be in thrifty condition but never plump with fat. When a colt looks like a colt, without the plump finish of a fitted horse, then it is the best form for strong growth of muscle and frame. About two quarts of ground oats daily will be sufficient for a colt of average size. Early maturity, when it is the result of forced growth by heavy feeding, does not produce the size and strength that would result from a steadier and more stable progress.

FEEDING COW'S MILK.

The grain food is usually sufficient to supply the needs of the colt, but in some instances it will be beneficial to assist the growth by feeding it some cow's milk. Some breeders adopt this as a general practice, but it has been claimed that colts so fed do not have the wearing qualities of those that are reared in the normal way. It used to be quite generally followed by those rearing colts for the turf, but the practice has been largely discontinued except in cases where trouble overtakes the colt's dam. When cow's milk is fed it should be weakened by the addition of one-third water, and also slightly sweetened. Carefulness should be observed to feed only small quantities at a time, and to feed at least six times daily at first in cases where the colt is altogether dependent on the milk.

FEEDING AFTER WEANING.

When the colt is about six months old, weaning is generally accomplished. At this time the quantity of oats should be increased and about three quarts will be found sufficient to keep it doing well. Besides these an occasional bran mash will be beneficial in so far as to keep the digestive powers of the colt in better tone. The best way to make it is to take the bran and steam it by pouring hot water on it and then covering it over with a heavy cloth. This is especially beneficial to the colt at the times when changes are going on in the nature

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of their teeth. Then their gums are sore and their system as a whole is in a feverish condition, and the bran mash is helpful to both of these conditions. When the colts are being weaned it is advisable to put a few of them together. They will eat better and they enjoy the company of each other.

TREATMENT OF THE YEARLING.

The yearling cannot be treated better than to feed ground oats with the addition of a pound of oilmeal, if the latter is reasonable in price. Three or four quarts of the oats will be sufficient in most cases. The feeding of ground oats will be found to give better returns in growth than if they are fed whole. At the Iowa Experiment Station an interesting experiment was carried on with yearlings in this direction. The daily ration of one lot of three yearling fillies was six pounds of ground oats, six pounds of corn and cob meal, two pounds of bran, one pound of oilmeal and five pounds of cut hay. The other lot was fed the same foods unground and uncut. The grain ration was increased up to sixteen pounds; they were heavy draft colts. In about six weeks the lot fed the ground and cut food gained 149 pounds, while the others only gained 127 pounds. The conditions were reversed with the same fillies and those receiving the ground and cut food from March 29 to May 8 gained 108 ponds and the others only fifty-seven ponds. T ese figures clearly indicate the increased nutritive value of such grain when ground for colts of this age.

When the colt reaches the age of three years it is likely to have more trouble with its teeth on account of changes taking place. Under the practice that is quite general at this time, the colt loses condition. To prevent this the use of ground, or better still, boiled food is helpful. In addition the quantity of grain food should be increased. A hearty colt will require at least eight quarts to keep it doing as well as it should. The amount needed beyond this will depend on the work that the colt is doing; its size will also be a factor in determining this.

The occasional use of such foods as carrots cannot be commended too highly both as a relish and as a medicine for the colt at all periods of its growth.—Farm, Field and Fireside.

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THE SHEEP FOR THE FUTURE.

John A. Craig, Wisconsin Agricultural Experiment Station, Madison.

The most popular sheep in the future is likely to be the one that shows the most ability in money making under the conditions that will then be prevalent. This leads to a consideration of the systems of sheep farming that are likely to be the most profitable in the future, and finally to a discussion of the sheep that are best adapted to those systems.

Markets of the Past and the Present.—From the time that the Merino sheep were imported into Spain by the Moors, some 1,200 years ago, they have played a prominent part in the pastoral life of both hemispheres, more especially during the time of early settlement. With the growth of more intensive and more economical farming, and the increase in a population that produced its own food, the sphere of the sheep widened and the mutton became greater in value than the wool. The three degrees of development in sheep farming in this country may be indicated by saying that the first is wool growing, the second, mutton production, and the third, early lamb rearing. In the far west, the fine-wool sheep conforms best with the care and the herding that is satisfactory for the growing of wool; in the central states the production of mutton is more profitable, as it is more in harmony with the system of general farming that is common therein; while in the east, it is equally true that there is the most profit in supplying the early lamb trade. The market for wool has made the first mentioned unprofitable, and the outlook remains gloomy, so that it is only necessary to consider the fattening of sheep and the rearing of early lambs as the two most profitable lines of the sheep industry in the markets of the future.

The Most Profitable System of Fattening Sheep.—Under such conditions as we have in this state—and they represent those of the greater portion of the middle states—the most profitable

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system of making mutton is that which has in view high feeding and rapid gain from birth to the block. From the data that I have secured from experimenting during the past three years in the feeding of lambs at all times of their lives until one year old, the most profitable method of feeding is undoubtedly that which keeps them doing the best they can from start to finish, by liberal feeding of grain and folding them on green crops. The lambs before weaning should get such grain as bran, and at ordinary prices, some oil meal; then, after weaning, some oats together with clover aftermath, rape or white turnips, and when put in the sheds—if the feeding is carried that far—fed for quick gains, so that they weigh 150 pounds when finished inside of a year's time. This system, if rightly understood, is more profitable than the common one which does not provide the lamb with any grain before weaning, but only pasture until fattening starts on the arrival of winter. Considering the cost of the extra food and giving the lambs the same care in every way except that one group was fed grain from the start and the other not, I have found as much as 50 cents per head more profit from those that had grain continuously, even though the grain were charged to them at market prices. It is the greater gain in flesh, the increased clip of wool and the higher price per pound which they bring even in our local market, that produces this extra profit. And, further, the grain-fed lambs are ready to sell at any time that the market prices are high.

The Sheep that Make the Quickest Feeders.—If this is the system that will ultimately prevail on our farms, early maturity must be a leading merit of the sheep that will fit into it best. They must be hearty and thrifty, gaining nearly three pounds per week throughout the time that they are fed. They must be strong in bone and of that bodily conformation that is universally known as that of a good feeder. There is one characteristic of the type that I have in mind which may not have been noted by some, and it is to the effect that the sheep which has the quickest feeding capacity is circular in form. The box-shaped animal may, after long feeding, become heavier and will certainly look heavier at all times; but in my experience, they have not been able to make as rapid gains. It has always seemed to me that Colling was near the truth when he stated

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that the animal with projecting brisket that goes far to make the box-shaped in the fore end, had invariably sharp shoulders and deficient chest development. He was a great improver of Shorthorns, and we are told that it was a favorite expression of his to liken his cattle to a barrel in shape. The Scotch breeders of the "Doddies" place this circular form as one of the cardinal points of their favorites, and I am not acquainted with the breed that will weigh heavier when the end of the second year comes around. I am not sure but the expression that the Poland China will grow and fatten at the same time, owes its possibility to a similar fact. The sheep that is the squarest is invariably the most projecting in the brisket, the flattest on the rib, or else it would not seem square from the side view, and it must have high hips to square the hind quarter. The sheep, in addition to being of this type must be active animals, for there is a period when it is necessary to fold them on such fodder crops as rape, white turnips, etc., to make the most profit from them.

The Source of These Sheep.—The breeding flock required to produce such feeding sheep, must average 200 pounds when mature and in fair breeding condition, and they must be of that type which guarantees constitution. They must be prolific. A good ewe will rear twins, and it means more profit to have her do so. The fleece in these sheep should, of all things, have density as it is associated with thrift and vigor. It is necessary that it be dense on the back to protect the sheep from snow and rain, and dense on the belly as well, as the latter is of special protection to the sheep when lying down. Fine wool is a quality that is related to density, and I do not believe that it is opposed to fattening qualities, but really the reverse. In killing and dressing sheep to determine the weights of different parts, I noted that the sheep that are comparatively coarse in wool, are heavy hided, coarse boned, and, as a rule, slower in maturing, and they lose more in dressing.

The Sheep for Early Lambs.—The rearing of early lambs is rightly considered to be the highest culture in sheep life, bearing the same relation to common sheep farming as truck or hothouse gardening does to general farming. The leading characteristic of the sheep suited for this work is that of breeding

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early in the season. As far as I have been able to experiment with the mutton breeds of sheep in this particular, none of them may be depended on to take the ram earlier than September except the Dorset and its grades. These will breed in June. Our flock of grades have done so. The sheep suited for this work are prolific. Of equal importance, is the possession of good milking qualities. There is no food that will give the lamb that early appearance of plumpness like the sustenance it will get from an abundant flow of milk from its mother.—Rural New Yorker.

APPLES AND APPLE GROWING IN WISCONSIN.

By A. J. Philips, West Salem, Wis.

The apple has been called the king of fruits and the name has been rightly given, because when we consider its wide range of adaptability and the various uses that it can be put to by the human family it is over all the fruits and none can fill its place; it is conducive to both health and happiness and if I can say anything for your columns that will induce more farmers to raise it and as a result cause more families to use it in large quantities, then I shall have accomplished the object for which I write. That its cultivation needs to be pushed and urged more than perhaps any other fruit or farm crop is obvious for several reasons, the principal being the great drawbacks that seem to surround the same. First. The difficulties that present themselves when the farmer undertakes to make his selections of varieties for different locations. Second. His liability to be swindled by the man with whom he deals and third, and by far the greatest obstacle that presents itself is the time it takes to cultivate, care for and wait before any returns, for expense, etc., are realized. Still I am of the opinion that with all these obstacles in the way, you as secretary of the agricultural society

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of a great and growing state, are using good judgment when you incorporate in your columns to be read by farmers, article on this subject; for I have seen and heard enough for several years past to conclude that the times demand it, as more inquiries have been made on this subject during the past twelve months than at any period of the same length of time since I can remember. I have stated in a previous article on this subject that the apple grower had not been assailed as the dairyman had been by a bogus product. The millionaire has, and is trying to crush and drive out honest dairymen and genuine cows, to add to his already great wealth; he is demoralizing the business of a nation in his anxiety to become richer; but he has never tried to imitate any product that will take the place of the first fruit mentioned in the Bible, to wit., the apple. Of course we have insect foes to fight. A late spring frost as is the case the present season may do damage. Still on the whole the apple crop is as sure as any take it one year with another, and after trees reach the bearing age no land on the farm will pay better for the labor bestowed than the orchard, and while waiting for this time to come other crops that will pay for the use of the land can be raised. Why do these inquiries pour in for information? Our farmers today are of two classes: First, those recently from the east where plenty of apples are grown, and second, those that occupy farms in Wisconsin where they found apple trees planted by their fathers or by former owners; and as these old trees fail, and no younger ones have been planted, they begin to see the need of information on this subject. Having been employed for nearly two years by the department at Washington to gather information on this subject has given me a chance to visit most of the counties in Wisconsin and some in Iowa and Minnesota; and when I realize the amount of rough uncultivated land that is in this state that might be successfully used in growing apples that is now lying idle or growing up to brush, I say I am prompted to try in a feeble way to throw out some light on it. While Sauk county is perhaps the best natural apple county in the state and annually produces thousands of bushels for market, still the amount of land occupied by orchards as compared by the unoccupied or idle land is as a drop in a bucket. And then in Monroe, Richland, Vernon, La Crosse,

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Dane, La Fayette, and other counties there are thousands of acres of unoccupied land that, with the application of grit, labor and intelligence, may be made profitable for the growing of apples. There is a long stretch of country to the southwest of Madison, along the C. & N. W. Ry—high rolling land, limestone cropping out on the surface in many places—where, I think, apples can be successfully grown; and you can travel miles and miles, and see scarcely a tree, though in the vicinity of Rewey I saw some fine tres and good apples growing. Still, perhaps the next neighbor had no orchard. While as I stated that Sauk county is excelled by no other in the state for natural commercial orcharding, my opinion is that Waupaca contains more good seedling apple trees than any other county in Wisconsin. Here the Wolf River was planted over forty years ago, and on the banks of the river after which it was named, produced its first fruit. This county is the home of the Wisconsin Russett, the Mary, the Jenny, the Ratsburg, the Garfield and Logan Sweets, the President Smith, the Lewis Duchess, the Manning Red, the Rose, the Alden, the Weyauwega, the Crocker, the Casey and many others that have been shown at our state fairs and winter meetings; also at the great shows of Chicago and New Orleans. They drew both premiums and compliments from the associations and visitors from the different states; and it affords me pleasure to state that in company of the veteran apple grower, Wm. A. Springer, I have visited all of the original trees that I have mentioned, save one, and have all of the varieties named on probation in my orchard; but will say that many of them do not do as well farther south as in their own county. Showing beyond a doubt that their nearness to bodies of water has a decided influence on their growth and longevity. Near Appleton is an orchard composed largely of seedlings of the Duchess, planted and carefully marked by a Mr. Randall over 25 years ago. I have four of the most promising from here on trial. Waushara county is the home of the Northwestern Greening, Richland of the McMahan, Sauk of the Newell and La Crosse of the Avista, all of which have their friends and are on trial. One of the handsomest apples shown at the meeting in Madison last winter was a seedling from the vicinity of Omro or Eureka. If it proves to be a seedling as is

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supposed and the tree is pronounced or found to be hardy and productive, it will be a great acquisition to our list of Wisconsin apples some of which have been adopted by growers in states south and west of us.

I said in a former article published, that, at the present time, we needed a fruit commissioner to disseminate information, and prevent people from being swindled as much as we need a dairy and food commissioner. Mr. Thomas Convey, one of the institute conductors, informed me that several thousands of dollars had a few years ago, been taken from his county for apple trees, and that scarcely a tree remained and no fruit had been grown. As previously stated, much of this loss and unsatisfactory results are directly chargeable to the farmer or planter himself, and not all to the seller. There are ways that the man without experience can inform himself and prevent his being swindled, and at the same time grow a paying orchard, providing he has a soil and location suitable. And right here let me say that what I say in this short article is intended, and only intended, for those situated on suitable locations and having proper soils for apple growing; others better let it alone. Well, I said there are ways to learn of this business; and the first and best way is to send a dollar to the secretary of the State Horticultural Society, which makes a man or woman a member. You will receive all the publications and reports of the society, get the experiences of the most experienced men of the state on the subject, be in touch with the work in other northern states. Take a good farm paper where you can ask questions on your work. Or, second, you can induce a few of your neighbors to join you. Send for a constitution and by-laws and organize a local society, put a live young man or woman in as secretary, send them to the state meetings and have them give you a report on their return. It will learn your boys and girls to conduct meetings, and increase in them a desire to cultivate fruits and flowers and will be a paying investment in more ways than one, and third, if the two plans given do not suit you, then take your horse and buggy, and, if possible, take your wife along and spend one or two days visiting one or more bearing orchards in your county when the fruit is on the trees. Then you will see object lessons as to varieties that you never could learn from books and

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papers. Take a book along and note down what you see, and your wife can make some selections, so that when the oily tongued agent comes to see you, you will be ready for him and by taking either of the three plans I have stated at an expenditure of less than five dollars, you may save being swindled out of ten to twenty dollars, and at the same time have a promising orchard growing. On the last obstacle and drawback I mentioned, to wit, the length of time to wait. I will quote from a former article I wrote on this subject. This we know is a fast age; early maturity and quick returns is the motto. The pig must be raised and sold at from six to eight months of age. The steer must be slaughtered at two years old. The sheep be killed and on the table before it has been twice shorn. The dairyman wants to count his money every week or month and apply it on debts or loan it to his less fortunate neighbors. The chicken must be hatched by steam, sold and killed before he strains himself to learn to crow in the morning; but the farmer has to wait from four to eight years for trees to begin to bear. At first only small crops, and unless he has taken the precautions I have given, perhaps no crops at all. Many times his patience is ex· exhausted and he gets tired waiting and neglects his trees; now is it not of great importance that he stars right in this business, can I emphasize it more! Our former secretary, B. S. Hoxie, after spending nearly all last fall at the great Chicago fair with the Wisconsin fruit exhibit, hearing remarks and inquiries from fruit men from all over the United States, makes this statement which is well worthy of consideration by all who have apple growing lands. It is as follows: I fully believe Wisconsin can hold her position with any of the fruit regions, and I wold today choose a site for an apple orchard in Wisconsin rather than an orange grove in California as far as dollars and cents go to make material wealth. I have recently had correspondence with men of states farther south asking price, etc., of our lands suitable for growing such apples as Wisconsin took to the world's fair last season. Ithink apple growers should feel encorraged. We have in addition to the old tried varieties of our state such as Fameuse, Russetts and Talman Sweets, the new and hardy Russians, Duchess, Hibernal, Longfield, Tetofsky and others, and still further our pioneers in this business have brought out

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the new seedlings of the north, the Wealthy, Wolf River McMahan, Avista, Newell and Northwestern Greening. Some of these have been adopted as far away as Colorado. I have found that nothing connected with apple growing pays better than protection while growing from three to ten years of age, or, until the top is of sufficient size to protect the trunk, and so far have found nothing that gives me better results than the lath protector, having used it ten to twelve years, the results are easily noticed; others are trying for something better. If found I will gladly adopt it. Another thing I have learned by experience: that the half-hardy varieties can be made more profitable in two ways by using some extra work. First, buy and set in your orchard, among the other trees, some root grafts. Set them where you intend them to grow and never transplant them, and see the result. Be sure they are of varieties that you know are good in your locality. Second, set some Virginia crab trees among the other trees in the orchard and at four years old bud or graft them in the limbs, saving the cions in November the previous year from trees that you know are good for your location. These I know will make good trees for I have had them bearing for ten years. This writing is intended for the boys and young men. It is pleasant work. You can not only do your own but you can top work some for your neighbors. If you have had no chance to learn then take my advice and spend one winter in the short course at Madison, and take the study of horticulture in the new building as one of your studies. This you will never regret as there you have a chance to learn in three months what we older ones have spent the best years of our lives in learning.

In concluding this article will say that in addition to the old hardy sorts, I have some new Russians and about thirty varieties of the new northern seedlings on trial and any one desirous of information on this subject will be shown all I can of interest if they will visit my orchard during the bearing season. There are several articles on apple growing and the discussions on the same as given at our last winter meeting; also some discussions taken from the Minnesota and Iowa reports published in our report for 1894, which is now out and will be sent to all applicants on receipt of twenty cents in stamps, if applications are

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made to the secretary at West Salem, Wisconsin. If any hints or thoughts have been thrown out in this paper that prove of value to any one, then the writing of it has not been in vain.

TUBERCULOSIS AND THE TUBERCULIN TEST.

H. L. Russell, Wisconsin Experiment Station.

This bulletin proposes to discuss the value of tuberculin, or, as it is sometimes called, "Koch's lymph," as a means of diagnosing tuberculosis in animals, especially in cattle. The data upon which the following pages are based were collected during the inoculation of the Station herd with tuberculin. In this connection, attention can only be called to the disease in a most general way, as it occurs in man and animals, so that any detailed consideration of the cause and distribution of the same must of necessity be extremely brief and imperfect.

GENERAL CONSIDERATIONS OF TUBERCULOSIS.

Most people now appreciate the contagious nature of consumption in man and understand that the virus of the disease is usually transmitted from person to person by the inhalation of the bacilli that are thrown out from the lungs. Until the epoch-making discoveries of Robert Koch, no one had demonstrated with absolute certainty that the disease now known as tuberculosis was caused by the ravages of the same germ, whether it was found in man or in the lower animals.

Prevalence of the disease in man.—To the human race, consumption in its various forms is more devastating than diphtheria, smallpox, scarlet fever, cholera and typhoid fever combined. An outbreak of a few cases of smallpox suffices to produce fear and alarm in any neighborhood, yet when one of

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every seven human beings that die, fall a victim to this fell destroyer, consumption, the great mass of people observe with helpless apathy, the condition of affairs and take no heroic measures to lessen its prevalence. This, too, when science and medicine have shown the disease to be a preventable and a curable one if taken in time.

According to the census returns of the United States for 1890 there are in Wisconsin annually 12 deaths in every 10,000 from pulmonary consumption (Phthisis) alone. If we add to this the numerous other tubercular affections that are not included under this head but are now known to be due to this same germ, the average will not fall much below 16 in 10,000. Taking the population of this state in 1890 as 1,700,000, this gives us 2,700 deaths per year that are to be traced directly to the ravages of the tubercle bacillus.

Now, the returns of the state board of health for 1891-1892 show that there were in this biennial period

1,781 deaths from diphtheria,
415 deaths from scarlet fever,
405 deaths from typhoid fever,
3 deaths from smallpox.

This aggregates 2,604 deaths from these contagious diseases during two years, or about 1,300 deaths for each year. Compare, then, the total mortality of these several dreaded diseases with that of consumption in its various forms, and some idea will be obtained of the relative importance of this malady.

Not until the discoveries of Koch was it known definitely that the "wasting-disease," consumption of the lungs, cold abscesses, hip joint disease, lupus of the skin and tubercular ulcers of the intestines were all produced by the growth and activity of the same kind of germ. Not only did he show this to be so, but he proved that similar maladies known under diverse names in different warm-blooded animals as the mammals (cow, sheep, hog, etc.), and birds were due to the inroads of the same parasitic organism.

Scientific medicine has demonstrated that consumption may in great part be prevented. Now that the cause of the contagion is known, the bacillus of tuberculosis, the manner in

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which it lives and the way in which it spreads its deadly virus, blind fatalism is no longer admissible. Armed with this knowledge, the continual spread of the infective virus and the subsequent infection of healthy individuals should be largely under control.

Prevalence of disease in animals.—When we attempt to determine the percentage of our domestic animals affected, we find considerable difficulty in collecting accurate data extending over any considerable number of years. In this country, the lack of general systematic inspection of live stock invests the percentages given with but little more value than an opinion. They may be based upon data collected locally, but certainly it would be unsafe to apply them to the country at large. In America the most extensive data are those collected by the bureau of animal industry in their meat inspection for the export trade.

Of the 2,270,000 animals slaughtered at the packing centers, from May 1891, to March 1892, only .02 per cent. were found affected, but it must be borne in mind that these were mostly young steers and the best too, that the country produced. Steers are very much freer from the disease than cows for various reasons. They live more of an open air life and have therefore much less opportunity of contracting the disease than they would if they were kept shut up, too often in dark, poorly ventilated stables, for a considerable part of the year. Just as the miner, the factory man and the mill man hand suffer more from tuberculosis than the farmer, the rancher and the gardener, so do outbreaks of this disease occur more frequently with stall-fed, closely-housed animals, than those that are given considerable exercise.

The presence of the tubercular virus is the essential thing in the spread of the disease, and the opportunity of absorbing larger numbers of bacilli will be very much greater in closed spaces, if they happen to be infected, than it would be in the open air. Then, too, the intense strain upon females produced by long periods of lactation, over-feeding and immature breeding suffice to make their systems more susceptible to the disease.

Of the 12,000 cattle killed by the pleuro pneumonia act in

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England in 1890-91, 12 per cent. were found to be tuberculous. The percentage as to sex was 16 per cent. of cows affected, while only 1.5 per cent. of the males were diseased.

Rockl in his exhaustive report on the spread of tuberculosis in Germany gives the following data of cattle slaughtered in Saxony during the year 1888:

	No. animals slaughtered.	Per cent tuberculous.
Bulls	72,000	2.6
Steers	36,000	1.2
Cows	180,000	6.9
Calves	375,000	.01

Of statistics of 50,000 head of tuberculous stock in the empire he found

Bulls	5.7 per cent.
Steers	5.6 per cent.
Cows	68.6 per cent.
Calves	0.4 per cent.
Not returned	4.5 per cent.

so that on the whole for one tuberculous calf there were about fourteen diseased steers and an equal number of bulls, thirty-eight oxen and one hundred sixty-nine cows.

Although the amount of tuberculous stock in this country that has been killed is very much less than that in Germany, yet experience has demonstrated that the conditions are quite the same here as there, that cows suffer much more from the disease than males. The importance of this should be understood when the chief danger to man arises from the use of milk of tuberculous animals. Owing to the great variation in the percentage of tuberculous animals in different herds and in different sections of the country, it is almost impossible to determine with any degree of accuracy the percentage of animals affected. The German statistics, which are undoubtedly the most thorough and comprehensive, give percentages ranging from 0.2 per cent. to 70 per cent. Rockl's figures are 5 per cent. of total stock, excepting immature animals and young calves, and from 6 to 7 per cent. of all cows as the percentage for the kingdom of Prussia.

The most experienced veterinarians in this country claim

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that, on an average, 5 per cent. of total stock is a fair estimate, especially in those sections where dairying and breeding are carried on to any considerable degree.* The inability to detect the disease in its incipient stages, however, has made it almost impossible to determine what percentage really exists. Unquestionably it is much wider spread than most people imagine; it is being still further distributed by the sale and interchange of diseased animals that may not as yet have presented any visible symptoms of the disease.

The manner in which the disease is contracted by man.—For our purpose we may regard the chief avenues of approach along which the tubercle bacillus gains an entrance into the human body under two heads: a. Infection by way of the lungs (pulmonary). b. Infection by way of the digestive tract (enteric).

a. Infection by air passages.—In the first case the bacilli gain access to the delicate air cells of the lungs by the ordinary processes of breathing. The virus of the disease in a dried condition retains its vitality for months, so that germ-laden air taken into the lungs finds in this susceptible organ favorable conditions of development. The earlier stages often pass unnoticed and soon the victim is firmly in the grasp of the disease and beyond human aid. To this source of contagion is to be ascribed the greatest importance, for by far the greater number of cases contract the disease from this source. So long as the sputa of consumptive patients is avoided indiscriminately and allowed to dry and mix with the dust, just so long will consumption ravage the human race.

b. Infection by intestines.—Now as to the second method of infection, by the way of the digestive tract. Fortunately in-

* While the American data collected under various conditions are as yet too meagre to give approximate averages, a few instances where the tuberculin test has been applied may be of interest: At Ottawa, Canada station, 26 animals out of a herd of 54 were found to be tuberculous; Pennsylvania station herd had 2 out of 29. Dr. Conrow r ports a Jersey herd (Vet. Mag. 1894, p. 12) in New Jersey where 48 cows out of 62 were diseased. In F. W. Hawley's herd of blooded stock at Pittsford Farms, N. Y., 100 animals out of 120 reacted; 15 of the 20 non-reacting animals were yearlings.

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deed for humanity, the intestines are less susceptible to this disease than the lungs. In adults a primary infection of the intestine is rare. It may happen, however, as a secondary infection where quantities of bacilli that are coughed up from the lungs are swallowed and in the already enfeebled condition of the body, the intestines prove unable to cope with the disease germ. In the case of children the intestinal tract is much more susceptible to the disease, so that the danger of infection is very much greater than in the case of adults. Dr. Shakespeare asserts that the mortality from tuberculosis among infants and young children, especially in large cities, is far greater than has been believed, amounting in some instances, to twenty per cent. of all deaths. It is significant also, he says, to note that the disease appears very frequently in the digestive tract or adjoining organs. Woodhead found that in 127 cases of tuberculosis among children, forty-three showed an ulcerated condition of the intestines, while 100 cases, or 70 per cent. showed tubercular degenerations of the glands of the intestine and adjoining organs.

With many other forms of bacteria the acid juices of the stomach form a safeguard against the entrance of disease germs into the more susceptible intestinal tract, but in the case of the tubercle bacillus, the gastric juice is unable to destroy the vitality of this disease organism, and consequently, if the bacilli are ingested with the food or drink they gain access to this susceptible organ.

The conditions of existence governing the growth of the tubercle bacillus are such that it is unable to multiply under natural conditions outside of the human body. It will, however, live in a dried-up condition in the dust for several months, retaining its virulence unimpaired and will hold its own against the ordinary putrefactive and decomposition bacteria, but it cannot increase in numbers below the temperature of 86 degrees F., and even then, it thrives very poorly. Its best temperature for growth is in the neighborhood of 98 degrees to 100 degrees F., the temperature of the human or animal body. For this reason there is but little chance of accidental contamination of food or drink to an extent that would cause the disease, unless positive carelessness prevails. Infection in

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this way is by no means impossible, but the factor is relatively slight when compared with the possibility of contracting the disease by the use of diseased food or drink. The most probable sources for such a contamination come from the consumption of meat and milk of tuberculous animals.

The danger arising from the consumption of tuberculous meat is, however, very much less than that from milk for the following reasons:

1st. Meat is consumed usually in a cooked condition and thus undergoes in the process of cooking a temperature sufficiently high to kill the disease germ, if present. Rare meats, however, are capable of producing infection, if they contain bacilli as the temperature of the interior of the flesh is not raised to the death point of the bacilli.

2d. In almost all cases where the animal is affected with the disease, the disease germs are found localized in the internal organs (abdominal and thoracic viscera) and are usually not present in the muscular parts that are used for food, unless the disease is much advanced.

With milk the condition is very different. In the first case, milk consumed either in the form of milk, cream, butter, or cheese is not subjected to a temperature sufficiently high to kill the tubercle germs. Then, too, the disease being more common with dairy cattle, the opportunities for transmission by means of the milk are much greater than with the meat. Especially is this true with children, as milk is such a prominent element of their diet.

Now, it is well known that tuberculosis in an animal, say a dairy cow, does not necessarily mean that that animal has tubercle bacilli present in the milk. If the disease is localized in the udder, it would of course be foolhary and nothing less than criminal to use the milk for human food. Tuberculosis is often a localized disease and the bacilli are to be found only in the affected organ. Now, if the disease be present in an incipient stage and localized in some organ distant from the udder, it may be possible that the animal in question would never in the course of the disease have tubercle bacilli in the milk. But if tuberculosis is present even in an incipient stage, the element of danger is evident; the barriers of the body are

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already broken down and the invading disease is within the lines of defense. Whether it is held in abeyance or not is a question that depends upon the virulence of the invading germ and the resisting properties of the body; questions concerning which we have no positive knowledge in each individual case. So that while tuberculous cattle may not always transmit contagion in their milk, the possibility of such a course is always to be considered. With cholera or smallpox we would quarantine this factor and by taking time by the forelock prevent an epidemic rather than to wait until after one had broken out and then attempt to stem its progress.

Recognizing then the importance of knowing absolutely whether an animal, the products of which are to be used for human food, has this disease in any stage, it would seem that every means that will enable us to recognize the disease in its earliest stages would be eagerly welcomed.

No one who has had any experience with this disease in cattle will consider it an easy task to diagnose correctly this malady in its earlier phases. In the more advanced stages, a competent veterinarian may be able to discriminate between the affected and unaffected animals, but such service often remains uncalled for until the mischief has been accomplished, either in respect to human health or in infecting healthy animals and thus spreading the disease through the entire herd.

USE OF THE TUBERCULIN OF KOCH AS A DIAGNOSTIC AGENT.

While Koch's tuberculin has not accomplished all that was hoped for it as a curative agent, yet its value as a means of diagnosing bovine tubercle is so great that if it fulfils no other purpose, it may be regarded as an eminent success. The extension of its use in Germany has been attended with such beneficent results that American dairymen and breeders can no longer afford to ignore its use in determining how far tuberculosis may be present in their herds.

What is Tuberculin?—Tuberculin is a glycerine extract of the soluble products that are produced by the tubercle bacillus in its growth. Bacterial life elaborate during their growth in

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favorable media, certain products often of a highly poisonous nature. Tuberculin is one of these.* It is made by filtering the glycerine extract of cultures of tubercle bacilli through germ-proof porcelain filters and then heating the filtrate sufficiently high to kill any tubercle germs that may possibly have passed an imperfect filter. It is therefore purely a chemical substance, devoid of all living germs, so that the charge often made against its use that it introduces the disease germs in a modified form into the animal has no basis for support.

Its action in living animal tissues.—When injected into healthy animals or animals not suffering from tuberculosis there is usually little or no reaction, but when this substance is introduced into the animal affected with this disease there is a marked change in its condition. A tuberculous state is evidenced by the marked fever that is set up, sometimes the temperature exceeding the normal by five or six degrees Fahr. The extent of the reaction as shown by the fever varies much, but unfortunately bears no relation to the magnitude of the disease in the animal. An animal may react where there is but a single gland affected and that to such a slight extent as to require a microscopic examination to prove the presence of the disease. To be able to draw an arbitrary line separating a reaction fever indicating tuberculosis from one that does not is not possible in all cases. Usually a rise in temperature of about 2 degrees Fahr. may be regarded as sufficient evidence that the animal is affected. This is usually considered as the minimum limit, but all animals that are regarded as doubtful should be tested a second time before being actually condemned.

The reaction fever may be accompanied by other symptoms than a rise in temperature, such as a loss of appetite, shrinking from contact, loosened stools, and more or less trembling and shaking, but these are only accessory symptoms and are in no sense of diagnostic value unless accompanied by the fever.

The tuberculin is supposed to act only upon the tuberculous tissue, that which has been or is affected by the tubercle bacil-

* Chemically speaking, tuberculin is probably a mixture of several substances as it includes all elements soluble in glycerine.

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lus. It hastens the activity of this affected tissue, causing degeneration changes that finally result in its death.

A healthy cow will not react strongly when the tuberculin is introduced into its system, but the continued incoulation of a tuberculous animal may intensify and hasten the course of the malady.

MANNER OF USING TUBERCULIN AND PRECAUTIONS TO BE OBSERVED.

The tuberculin prepared according to Dr. Koch's formula and imported into this country comes in a very concentrated solution so that it is necessary in using it to dilute it with some sterile indifferent fluid. For a diluting fluid, one-half to one per cent. carbolic acid is the usual substance. With this a ten per cent. solution of the tuberculin is usually made.

The tuberculin prepared by the United States department of agriculture under the direction of the bureau of animal industry comes in a much more diluted condition and is ready for immediate use. For an injecting instrument, a veterinarian's hypodermic syringe will suffice but it and the needles employed should be carefully disinfected by soaking in a strong carbolic solution (5 per cent.) for at least several hours. The point of injection may be varied somewhat. We have usually chosen a spot immediately in advance of the shoulder as here the skin is thinner than immediately over the shoulder. After the hair has been clipped off at the point selected, the spot is well saturated and rubbed with a 5 per cent. carbolic solution (creolin is often recommended) and the inoculation made with the sterile syringe. A light pressure on the spot after injection distributes the fluid. The needle is immersed in a disinfectant after each using. We have never experienced any local swelling at the point of inoculation when such a method of procedure was carried out.

The best time for making inoculations is either in the early morning or late afternoon. For convenience the early morning is perhaps preferable as the reaction usually begins to indicate itself in six or eight hours and if a tuberculous reaction is found it will be manifest by afternoon or evening of the same day. We have made all our own inoculations late in the

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afternoon as it was necessary to take readings through at least twenty hours. In actual practice, of course, it is not necessary to take readings of falling temperatures as the maximum temperatures are sufficient for the purpose.

Tuberculin is not an infallible agent for diagnostic purposes. Like all useful things its use can be abused so that it needs considerable care and discrimination in employing it. To inject equal quantities of the material into animals regardless of age, weight and general condition and then say that when the reaction fever exceeds a certain amount in every case that the animal is tuberculous will give results that are entirely unwarranted. The lymph must be employed with caution and its results must sometimes be interpreted in the light of other conditions. The objections to its use for diagnostic purposes are without question often due to the fact that external conditions are not sufficiently considered.

Thus, for instance, a rise in temperature of one and one half degrees above average normal, which ordinarily would be considered as indicating a non-tuberculous condition, might under certain circumstances be a sufficient reaction to indicate disease. If this increase in temperature took place at a time when the normal temperatures were falling, the reaction would really be greater than the bare statement of the fact would show; also, if the temperature previous to inoculation was abnormally high, the apparent reaction would be too small. Considerable care must be taken in securing the normal average before injection. We have usually taken the temperature from four to six times on the day preceding the inoculation and then adopted the average of this as a basis for computation. Often there may be a temporary rise in temperature due entirely to external influences. Sudden variations in customary treatment, such as close confinement or sudden exposure or prolonged thirst may cause a temporary febrile condition. Animals in heat or approaching parturition should not be injected as results cannot be always depended upon under such circumstances. The temperature should be taken with reference to eating and drinking as these may often influence the animal heat very materially.

The dose administered must be varied according to condi-

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tions. Calves and heifers naturally require a much smaller dose than fully developed animals, while a bull may receive a larger dose than a fully matured female. An animal in apparent good health seems to require less than one that is lean and poor. Directions are mailed with the Bureau tuberculin indicating the dose to be employed, which varies from 2-3 cc. of tuberculin as sent. With the imported brand a much smaller dose is administered. (0. 1-0. 4. cc. of the concentrated solution.) Usually the pure tuberculin is diluted with nine times its volume of 1-2 or 1 per cent. carbolic acid. In our own experiments a still more dilute solution (1:100) was employed (owing to the large syringe used for injecting), but the same amount of actual tuberculin was employed, that has given successful results in other cases, although the doses used in these experiments have been uniformly less than usual, owing to our inability to secure sufficient quantities to inject the whole herd.

The period of the reaction fever varies considerably, depending upon tuberculin used and its effect upon the animal. Usually, if the disease is present, the temperature begins to rise in 6-9 hours, gradually increasing until the maximum is reached in from 12-20 hours, when it falls to the normal. During the fever period the temperature must be taken frequently (two hour intervals), as it often reaches the maximum and falls somewhat in the lapse of three hours.

Rectal or vaginal temperatures may be taken to determine the state of the fever although it is better to use either one or the other exclusively in the same animal.

RESULTS OBTAINED WITH TUBERCULIN IN THE STATION HERD.

The examination of the station herd with tuberculin was primarily designed as a demonstration of the value of this test for our course students, but an inoculation of a few animals revealed so large a percentage affected that it was deemed advisable to make as complete and thorough study of the subject as was possible. Our herd was a mixed herd of grade and registered animals of the Shorthorn, Jersey and Holstein breeds. Most of the animals had been raised on the farm, but several full-blooded cows were purchased several years ago.

In looking up the history of the herd it was found that a

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few cows had died from time to time, but none of them had been found to be tuberculous. At the time this test was instituted two animals had been isolated for some time (Melvina for a chronic nasal discharge, and Clothilde for an indurated swelling of the udder). An examination of the latter animal showed evident signs of tuberculosis. Aside from these two cases we had no reason to expect but that the herd was in a good condition and as free from disease as the average. This fact is especially dwelt upon at this point in order to emphasize the results and conclusion reached later.

The work of inoculating the herd has been carried on conjointly with Dr. W. G. Clark, instructor in veterinary science. In making the post-mortems Dr. Clark and the writer have been materially aided in several instances by Dr. W. S. Miller, instructor in anatomy in the university.

The original tuberculin as prepared by Dr. Libbertz, of Berlin, under Koch's formula has been the only one available until recently.* The importance of this work has led the bureau of animal industry of the United States department of agriculture to experiment on this subject and they have recently prepared a brand of tuberculin that is being extensively used by boards of health and some experiment stations for experimental purposes.

It was originally intended to make a comparative series of tests with these two brands, but failure to secure sufficient quantities of imported tuberculin frustrated this plan in part. Double inoculations were however made with part of the herd and the results obtained are of interest although the dose used of imported tuberculin was not as large as is usually employed.

The two brands were tested in the following way: Eighteen animals were selected and divided into two sections. The first injection was made on one half of the herd with the imported tuberculin and the remainder were inoculated with the domestic product. After a proper lapse of time the test was repeated, reversing the order of the lymphs used. In this way the conditions were equalized as much as possible. The younger stock was not included in this comparative test so they received only one injection. The results are arranged in tabular form:

* Schulze-Berge & Koechl of New York City are the American importers of this fluid.

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TABLE 1 A.—*Temperature records of Station herd taken previous to first inoculation with tuberculin.*

No.	NAME.	Breed.	4 P. M.	6 A. M.	8 A. M.	12 M.	4 P. M.	8 P. M.	Average normal temperature.	Date of inoculation	Amount and kind of tuberculin.	Weight of animal.
1	Polly	Grade Jersey	.....	.....	101.3	101.8	101.6	101.	101.42	10 P. M., Feb. 20	2 cc., Bureau	776
4	Gay	Jersey	.....	.....	101.	100.9	101.3	101.	101.05	10 P. M., Feb. 20	2 cc., Bureau	871
9	Daisy	Grade Jersey	.....	.....	99.6	101.2	101.4	101.2	100.85	10 P. M., Feb. 20	2 cc., Bureau	778
2	Bessein	Grade Jersey	101.8	.....	101.6	101.4	102.	.....	101.70	10 P. M., Feb. 20	2 cc., Bureau	902
3	Doubtful	Grade Jersey	101.5	.....	101.6	101.4	101.2	.....	101.42	5 P. M., Feb. 23	2 cc., Bureau	952
5	Aaggie	Holstein	101.1	.....	101.7	101.	101.3	.....	101.28	5 P. M., Feb. 23	2 cc., Bureau	1,017
6	Galena	Grade Jersey	101.2	.....	102.2	100.4	101.	.....	101.20	5 P. M., Feb. 23	2 cc., Bureau	978
15	Melvina	Short Horn	101.8	.....	102.1	102.	102.	.....	101.97	5 P. M., Feb. 23	3 cc., Bureau	1,280
16	Miss Cowslip 6th	Short Horn	101.	.....	101.8	100.8	101.6	.....	101.30	5 P. M., Feb. 23	2.75 cc., Bureau	1,317
7	Rue	Jersey	103.3	101.4	.....	99.4	100.	.....	101.25	5 P. M., Feb. 23	.03 cc., Imported	980
8	Neth. Nugget	Holstein	100.2	100.6	.....	100.4	101.7	.....	100.73	4 P. M., Mar. 13	.0375 cc., Imported	1,122
10	Bunn	Gr. Holstein	102.3	102.2	.....	101.8	102.	.....	102.08	4 P. M., Mar. 13	.0375 cc., Imported	1,200
11	Beauty	Native	101.1	101.2	.....	99.6	101.6	.....	100.88	4 P. M., Mar. 13	.03 cc., Imported	1,120
12	Bessie, 2d	Grade Jersey	102.	102.	.....	100.4	101.8	.....	101.55	4 P. M., Mar. 13	.025 cc., Imported	930
13	Palmyra	Grade Jersey	101.2	101.7	.....	100.6	101.6	.....	101.25	4 P. M., Mar. 13	.025 cc., Imported	906
14	Pansy	Grade Jersey	102.3	102.	.....	101.6	101.9	.....	101.95	4 P. M., Mar. 13	.025 cc., Imported	816
17	Clothilda Rosa	Holstein	103	101.	.....	101.7	104.9	.....	103.40	4 P. M., Mar. 13	.03 cc., Imported	1,077
18	Colantha Rosa	Holstein	102.1	102.1	.....	102.	102.1	.....	102.08	4 P. M., Mar. 13	.03 cc., Imported	933
19	Experimentalist	Jersey, male	101.1	101.5	.....	101.	102.	.....	101.40	4 P. M., Mar. 13	.0375 cc., Imported	1,336

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No.	Name.	Breed.	4 P. M.	6 A. M.	8 A. M.	12 M.	4 P. M.	8 P. M.	Average normal temperature.	Date of inoculation.	Amount and kind of tuberculin.	Weight of animal.
20	Lady Mosscoat...	Short Horn...	.....	.....	102.	102.1	101.8	.....	101.95	5 P M., May 2	.03 cc., Imported.	1,022
21	Melrose.....	Short Horn...	.....	.....	101.8	101.4	101.9	.....	101.75	5 P. M , May 2....	.0225 cc., Imported	830
22	Pet.....	Ayrshire	.....	.....	102.1	102.5	101.9	.....	102.12	5 P. M., May 2....	.0225 cc., Imported	684
23	Galatea	Grade Jersey.	.....	.....	.....	102.3	102.7	.....	102.75	5 P. M., May 2....	.0125 cc., Imported	400
24	Melnotta	Short Horn...	.....	.....	.....	102.8	102.8	.....	102.80	5 P. M., May 2....	.0125 cc., Imported	295
25	Rosette.....	Grade Jersey.	.....	.....	.....	102.4	102.3	.....	102.35	5 P. M., May 2....	.0125 cc., Imported	275
26	Nugget.....	Holstein.. ..	.....	.....	.....	102.8	102.9	.....	102.85	5 P. M., May 2....	.0125 cc., Imported	456
27	Blossom.....	Grade Jersey.	.....	.....	102.9	101 6	102.5	.....	102.45	5 P. M., May 2....	.015 cc., Imported	366
28	Augustus.....	Holstein.....	.....	.....	102.5	101.8	102.5	.....	102.32	5 P. M., May 2....	.019 cc., Imported	678
29	Chloe.....	Holstein.....	.....	.....	.....	102.7	102.3	.....	102.45	5 P. M., May 2....	.0125 cc., Imported	340
30	Josephine	Grade Jersey.	.....	.....	102 4	101.9	102.5	.....	102.35	5 P. M., May 2 ...	.011 cc., Imported	184

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TABLE 1B.— *Temperature records of station herd subsequent to first inoculation with tuberculin.*

No.	Name.	Average normal temperature.	6 hours	8 hours	9 hours	10 hours	11 hours.	12 hours.	14 hours.	16 hours	18 hours	20 hours.	21 hours.	23 hours.	40 hours	Reaction above average normal.	Reaction above highest normal.
1	Polly	101.42	.....	.....	103.9	.....	101.9	106.	***106.2**	105.4	105.	105.4	.....	.....	.....	***4.8***	***4.6***
4	Gay	101.05	.....	.....	101.7	.....	102.7	103.9	***104.4***	104.	102.5	101 5	.....	.....	.....	***3.4***	***3.1***
9	Daisy	100.85	.....	.....	102.4	.....	***103.8***	95.5	100.6	102.4	102.4	101.5	.....	.....	.....	***3.0***	***2 4***
2	Bessein	101.70	.....	102.3	.....	102.7	.....	103.3	103.2	103.3	102.6	102.4	.....	.....	.....	1.6	1.3
3	Doubtful	101.42	.....	101.2	.....	101.5	.....	101.9	102.3	103.1	102.4	101.6	.....	.....	.....	1.7	1.5
5	Aaggie	101.28	.....	102.8	.....	104.	.....	105.2	***105.6***	104.6	103.8	102.3	.....	.....	.....	***4 3***	***3 9***
6	Galena	101.20	.....	101.8	.....	102.4	.....	103.4	104.2	***104.9***	103.7	103.7	.....	.....	.....	***3.7***	***2.7***
15	Melvina	101.97	.....	105.2	.....	***106.4***	.....	106.3	105.6	106.4	105.	105.1	.....	.....	.....	***4.4***	***4.3***
16	Miss Cowslip	101.30	.....	101.6	.....	102.	.....	102.2	102.5	102.5	101.8	101.9	.....	.....	.....	1.2	0 9
7	Rue	101.25	101.2	102.2	.....	101.5	.....	102.8	101.2	.....	101.6	98.7	102.	.....	.....	1.6	1.4
8	Neth. Nugget	100.73	101.7	102.	.....	101.9	.....	102.1	102.4	.....	***103.5***	101.8	102.4	.....	.....	***2 8***	***1.8***
10	Bunn	102.08	101.6	101.4	.....	101 4	.....	101.6	101.5	.....	102 7	102.1	102.7	.....	.....	0.6	0.4
11	Beauty	100.83	100.6	101.2	.....	101.2	.....	101.3	101.6	.....	102.5	101.	101.9	.....	.....	1.6	0.9
12	Bessie 2d	101.55	101.6	101.7	.....	101.4	.....	102.1	102.1	.....	***104.6***	103.2	102.5	.....	.....	***3.1***	***2 4***
13	Palmyra	101 28	102.	101.6	.....	101.7	.....	102.3	103.2	.....	***104.9***	102.4	102.2	.....	.....	***3.6***	***3.2***
14	Pansy	101.95	102.	102.	.....	102.	.....	102.3	102.5	.....	***104***	102.1	102.8	.....	.....	***2.0***	***1.7***
17	Clothilde Rosa	103.40	105 5	105.3	.....	104.7	.....	105 2	05.5	.....	105 2	101.5	101.8	103.	***106.3***	***2 9***	***1 4***
18	Colantha Rosa	101.86	102.5	102.4.	.....	102.8	.....	103.3	104	.....	***106.5***	105.	103.3	101 2	103.7	***4 6***	***4 4***
19	Experimentalist	101.40	101.4	101.	.....	101.9	.....	102 4	102 3	.....	105.7	***106.5***	105.2	101 2	101.8	***5.1***	***4 5***

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No.	Name.	Average normal temperature.	6 hours.	8 hours.	9 hours.	10 hours.	11 hours.	12 hours.	14 hours.	16 hours.	18 hours.	20 hours.	24 hours.	28 hours.	40 hours.	Reaction above average normal	Reaction above highest normal.
20	Lady Mosscoat.	101.95	.....	.....	.....	.....	.....	***104.7***	.....	101.	104.7	.....	.....	.....	.....	***2.8***	***2.6***
21	Melrose.....	101.75	.....	.....	.....	.....	.....	102.3	.....	***106.5***	105.9	.....	.....	.....	.....	***4.7***	***4.6***
22	Pet	102.12	.....	.....	.....	.....	.....	100.8	.....	102.1	102.	.....	.....	.....	.....	0.0	−0.4
23	Galatea	102.75	101.3	102.5	.....	103.2	.....	103.4	.....	***105.4***	104.7	105.4	.....	.....	.....	***2.6***	***2.6***
24	Melnotta.....	102.80	103.2	101.4	.....	105.3	.....	105.9	.....	***106.6***	106.	105.8	.....	.....	.....	***3.8***	***3.8***
25	Rosette.....	102.35	102.8	103.6	.....	101.4	.....	104.7	.....	***105.5***	104.4	105.2	.....	.....	.....	***3.1***	***3.1***
26	Nugget.....	102.85	102.5	103.5	.....	101.5	.....	***106.5***	.....	106.4	106.3	106.5	.....	.....	.....	***3.8***	***3.8***
27	Blossom.....	102.5	.....	.....	.....	.....	.....	105.8	.....	106.2	***106.8***	.....	105.8	.....	.....	***4.4***	***3.9***
28	Augustus	102.32	.....	.....	.....	.....	.....	103.7	.....	103.9	***104.8***	.....	103.1	.....	.....	***2.5***	***2.3***
29	Chloe	102.45	102.8	102.8	.....	102.9	.....	104.7	.....	***105.6***	105.5	104.6	.....	.....	.....	***3.1***	***2.9***
30	Josephine	102.35	.....	.....	.....	.....	.....	101.8	.....	102.1	102.3	.....	.....	.....	.....	0.0	−0.1

* Bold face type indicates maximum temperature reached in diseased animals.

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Tables 1 A and 1 B represent the temperature readings of the entire herd (1 A before the inoculation, 1 B subsequent to injection) as they were taken at the time of the first inoculation of each animal. The records of those animals on page 16 belong to the series in which the two brands of tuberculin were used. Temperature records of animals on p. 191 are those of the young stock and calves that received only a single injection.

The foregoing summary includes the entire number of animals of the herd, all of which were inoculated with tuberculin at one date or another. Of the 30 animals in all 22 responded to the tuberculin test.

Of the 18 animals chosen for the comparison of the domestic and imported brands of tuberculin, nine were injected with the Bureau fluid, six of which reacted, while of the remainder that received the imported substance six were diagnosed as tuberculous.

Of the young stock inoculated with the imported lymph nine out of eleven showed reaction fevers indicating disease.

A repetition of the tuberculin test in the same animal can be successfully made only after a certain lapse of time. If a a second dose is injected too soon after the first, no reaction fever will occur even though the animal may be diseased. For this reason there must be a lapse of at least a month before the second test can be applied.

As will be noted, the extent of the reaction varies considerably. In every case but one (Pansy) the reaction was so marked that there could be no mistake in interpreting the result. In this single instance, the rise in temperature above average normal was but 2 degrees F. and above highest normal only 1.7 degrees F. but the fact that she reached 104 degrees F. at the time of maximum rise of reacting animals, and that her normal temperature before inoculation was somewhat above the average (101.95 degrees F.) led us to consider her as diseased. The autopsy made on the animal later confirmed the diagnosis and showed the correctness of this interpretation.

Tables 2 A and 2 B give the temperature records of those animals that received a second injection of the tuberculin. In this series of inoculations the brand of tuberculin used was in all cases different from that employed in the first series, i. e., those

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animals inoculated with domestic tuberculin in the first instance received the imported product the second time and vice versa. In order to do this it was necessary to allow a certain lapse of time to intervene before the second injection could be made and as the animals were housed in the same quarters that they had been there was of course the possibility that some of them might have contracted the disease in this lapse of time and would then react upon second inoculation.

In referring to the two tables giving the temperature results, it will be seen that such an instance did occur in the case of two animals, Rue and Bunn, both of which responded to the test upon the second injection after having been declared healthy by the first. The lapse of time between the introduction of the tuberculin the first and second time was about seven weeks. The animals were killed a few days after the second injection and were both found to be tuberculous.

It will be noted in several instances that animals failed to react when inoculated the second time with the imported lymph that had reacted upon first injection with the bureau tuberculin. This evident discrepancy between the efficiency of the two brands, in picking out the diseased animals, can undoubtedly be explained. The failure to produce a reacting temperature in those animals that had previously been diagnosed as tuberculous with the bureau tuberculin is due to the minimum doses used. The bureau fluid as injected is more concentrated than the imported product as used in the diluted condition by us, so that the amount of actual tuberculin introduced at the second injection was less than what was used at the first. While an introduction of this same quantity sufficed to produce a reacting temperature in the first inoculation of an animal, yet this same amount introduced into an animal that had been previously inoculated with a stronger dose sometimes failed to produce the usual febrile symptoms.

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TABLE 2 A.—*Temperature records of herd preliminary to second inoculation.*

No.	Name	4 P. M.	6 A. M.	12 M.	3 P. M.	Average normal temperature.	Date of inoculation	Amount and kind used.	Weight of animal.
1	Polly	102.3	102.3	100.6	101.8	101.70	4 P. M., March 20.	2.75 cc., K	779
4	Gay	101.2	101.6	99.7	101.4	101.00	4 P. M., March 20.	2.75 cc., K	825
9	Daisy	101.1	102.2	99.9	101.7	101.22	4 P. M., March 20.	3. cc., K	766
2	Bessein	101.1	101.8	101.8	101.1	101.45	4 P. M., May 3	2. cc., K	814
3	Doubtful	101.7	101.4	102.	101.5	101.65	4 P. M., May 3	2. cc., K	853
5	Aaggie	101.4	101.6	102.7	100.1	101.45	4 P. M., May 3	2.1 cc., K	916
6	Galena	101.2	101.8	101.8	99.7	101.38	4 P. M., May 3	2.1 cc., K	911
15	Melvina	101.1	101.1	101.1	101.2	101.12	4 P. M., May 3	2.5 cc., K	1,210
16	Miss Cowslip 6th	102.	101.9	103.2	101.4	102.12	4 P. M., May 3	2.5 cc., K	1,226
7	Rue	100.5	101.5	101.4	100.3	100.92	4 P. M., May 3	2. cc., B	880
8	Neth. Nugget	101.3	101.8	101.8	101.8	101.68	4 P. M., May 3	2.5 cc., B	958
10	Bunn	101.3	101.3	101.3	101.3	101.30	4 P. M., May 3	2. cc., B	1,151
11	Beauty	101.6	101.5	101.8	101.5	101.60	4 P. M., May 3	2.1 cc., B	982
13	Palmyra	101.6	101.1	101.7	101.5	101.48	4 P. M., May 3	2.1 cc., B	821
14	Pansy	101.7	101.4	102.	100.9	101.50	4 P. M., May 3	2.0 cc., B	795
12	Bessie 2d	101.3	99.6	100.3	100.	100.30	4 P. M., May 3	2. cc., B	691
18	Colantha Rosa	101.9	101.4	101.9	101.2	101.60	4 P. M., May 3	1.75 cc., B	955
19	Experimentalist	102.	10.21	102.	102.	101.80	4 P. M., May 3	3. cc., B	1,261

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TABLE 2 B.—*Temperature after Inoculation.*

No.	Name.	Average normal.	5 hours.	8 hours.	10 hours.	13 hours.	16 hours.	18 hours.	20 hours.	24 hours.	Reaction above average normal.	Reaction above highest normal.
1	Polly.	101.70	103.7	104.5	104.9	***105.1***	103.4	102.7	101.6	.....	***3.4***	***2.8***
4	Gay	101.00	101 3	101.2	101 1	101.5	101.7	101.5	101.1	.....	0.7	0.1
9	Daisy	101.22	101.9	101.2	101.7	101.7	101.8	102.	102.3	99.7	1.1	0.1
2	Bessein	101.45	101.5	101.5	101.2	101.4	102.	102.9	101.5	.....	1.4	1,1
3	Doubtful	101.65	101.4	101.2	101.8	102.5	102.2	102.1	102.	.....	0.8	0.5
5	Aaggie	101 45	102.2	102.	101.8	102.	102.2	102.4	102.9	102.7	1.5	0.2
6	Galena.	101.38	101 7	101.7	101.6	101.7	102.2	101.8	101.6	.....	0.8	0 0
15	Melvina	101.12	102.3	101.8	101.9	102.4	101.9	102.2	***103 1***	103.	***2.0***	***1.9***
16	Miss Cowslip 6th	102.12	102 5	101.8	102.4	102.1	103.5	103.4	103.4	.....	1.4	0.2
7	Rue	100.98	101.	101.	101.4	103.1	104.	104.5	104.4	.....	***3.5***	***3.0***
8	Neth. Nugget	101.68	101.5	101.8	102.2	103·3	***105.2***	104.9	104.7	.....	***3.5***	***3.4***
10	Bunn	101.90	100.9	101.3	101.5	***103.4***	103.3	102 6	102.4	.....	***2.1***	***2.1***
11	Beauty	101.60	101.6	101.4	101.8	102.6	102.9	102.7	102 5	.....	1.3	1.1
13	Palmyra	101.48	101.3	101.5	101.9	104.6	105 4	***105.5***	105.1	.....	***4 0***	***3.8***
14	Pansy	101.50	102.	103.	103.9	***105.***	104.9	104.6	104.2	.....	***3 4***	***3.0***
12	Bessie 2d	100.30	***104.1***	103.6	103.	102.6	102.	101.9	101.9	.....	***3.8***	***2.8***
18	Colantha Rosa	101.60	101.8	102.1	101.8	102.6	103.	102.7	102.1	.....	1.4	1 1
19	Experimentalist	101.80	102.4	105.	***105.7***	103.6	103.9	104.9	105.4	103.8	***3.9***	***3 7***

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As evidence that this explanation is possible note the tabular résumé of animals inoculated on p. 205. Out of a possible 28 cases of which we can determine with certainty whether the diagnoses were correct or not as post-mortems were held, the imported lymph diagnosed correctly in 21 out of 28 cases. If, however, we exclude those animals that received the imported lymph after having first been injected with the stronger bureau lymph (nine animals were thus injected, but as two were not killed seven may be deducted), then the number of cases correctly diagnosed is 18 out of a possible 21, or 86 per cent.

Two out of three exceptions (Bunn and Rue) may possibly have contracted the disease after they were inoculated with the imported tuberculin as they were not killed until seven weeks later.

The results obtained with the bureau tuberculin are more evident. Eighteen animals were inoculated with this brand, and of this number thirteen showed reaction fevers, indicating a diseased condition. With these thirteen that were diagnosed as diseased, characteristic tubercular lesions were noted upon each autopsy. Three of the five non-reacting animals were also killed. Of these two cases (Doubtful and Beauty) had not reacted upon first and second injections, the third one, Colantha Rosa reacted the first time with imported tuberculin, but in the second injection with the bureau fluid, an accident occured in which a considerable part of the dose was lost, consequetly this animal is excluded. When these three animals were killed Colantha Rosa and Beauty were found diseased but Doubtful was entirely free from it. Omitting Colantha Rosa on account of the above accident the record would indicate that the bureau tuberculin returned correct diagnoses in fourteen out of a possible fifteen cases, or 93 per cent.

The single instance in which the bureau tuberculin failed to diagnose correctly was in the same animal (Beauty) that did not respond to the imported product. In this instance the test failed to indicate that the animal was diseased, but the autopsy showed a well pronounced diseased condition of the lymphatic glands of the pharynx. The results of both tests show the efficiency of tuberculin as a diagnostic agent, as follows:

Thirty animals were inoculated in all; of these twenty-five

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reacted, and the remainder were declared healthy. The autopsy record shows that in every one of the twenty-five reacting animals evident lesions of the disease were discovered.

Of the five animals that failed to react three were slaughtered and one of these was found to be somewhat diseased so that in the twenty-eight cases where post-mortems were made, it failed only once.

Infallibility is not claimed for tuberculin, but it is asserted that it is far superior to any other method of diagnosing the disease of which we have any knowledge.

Prof. Nocard, the eminent French veterinarian, reported to the recent congress held for the study of tuberculosis, the results of over 1,500 cases in which either he or his students had made inoculations with tuberculin. Out of this number they found 124 animals that showed reaction fevers, or about 8 per cent. of all animals tested; 192 of the animals submitted to the test were slaughtered under his control, including all of those that had reacted. The autopsies revealed the presence of tubercular lesions in every one of the 124 cases diagnosed as diseased with but one exception. In the 68 cases that were examined that had been declared by the test to be free from the disease, all but nine were found to be correctly diagnosed. In every one of these nine cases, the disease was in such an advanced stage that it would have been readily discovered without the aid of the tuberculin test. Nocard, in the light of his present experience, considers the single exception that occurred in his positive diagnosis to be due possibly to an oversight, it being quite possible to overlook the presence of a small tuberculous area in the animal that was also affected with another disease.

The extent of the reaction in each animal can be noted in tables 1 B and 2 B, also the time of maximum rise in temperature, but in order to present a more graphic representation of the rise in temperature produced by the injection of tuberculin, composite temperature charts have been constructed which show the average temperature curve of the eighteen animals under different conditions.

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CHART I.

COMPOSITE TEMPERATURE CHART OF TEN ANIMALS SHOWING NO REACTION WITH IMPORTED TUBERCULIN.

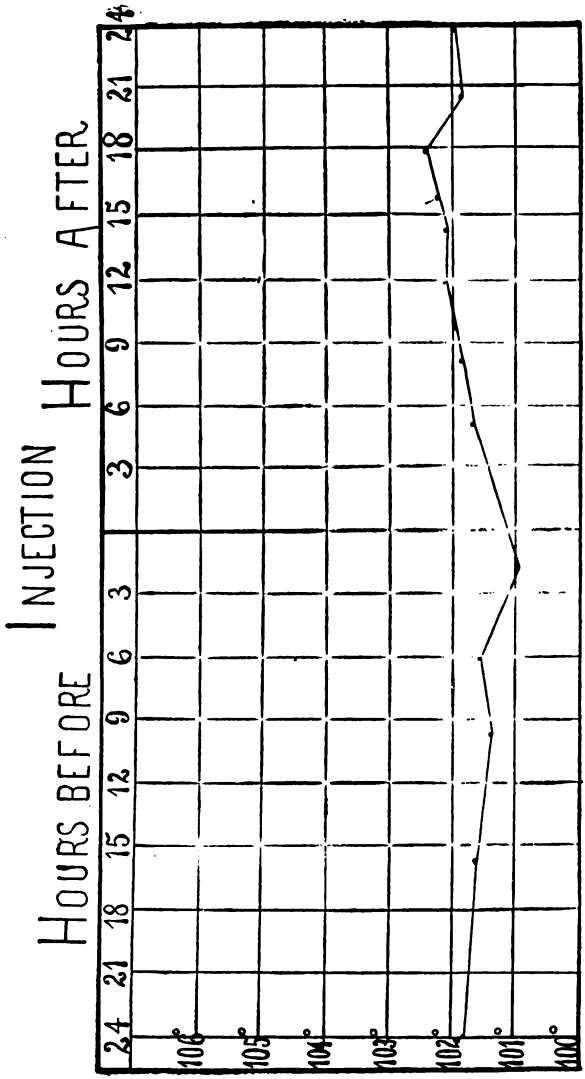

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CHART II.

COMPOSITE TEMPERATURE CHART OF EIGHT ANIMALS SHOWING A REACTION WITH IMPORTED TUBERCULIN.

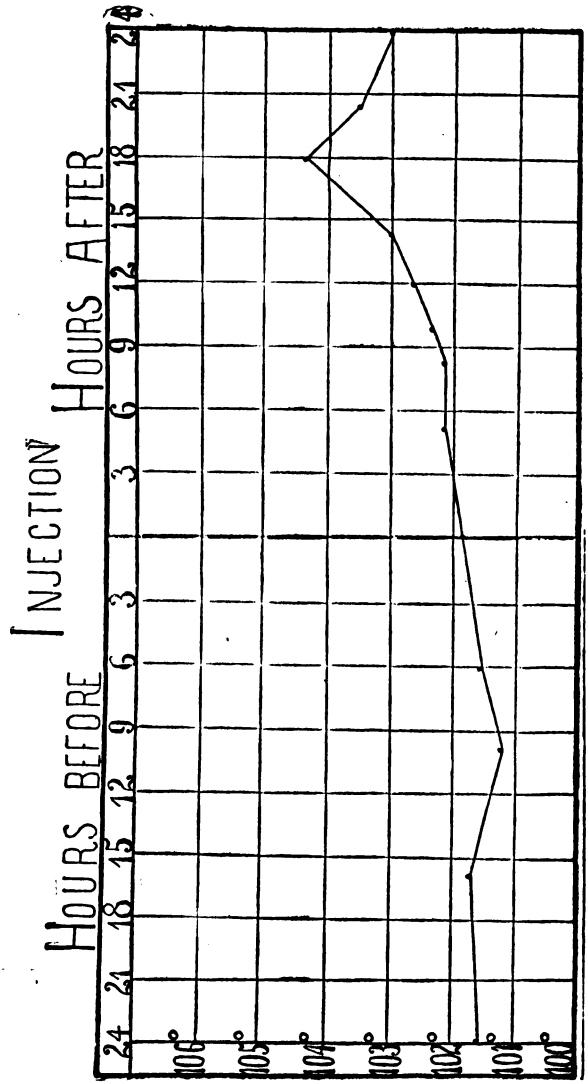

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CHART III.

COMPOSITE TEMPERATURE CHART OF FIVE ANIMALS SHOWING NO REACTION WITH BUREAU TUBERCULIN.

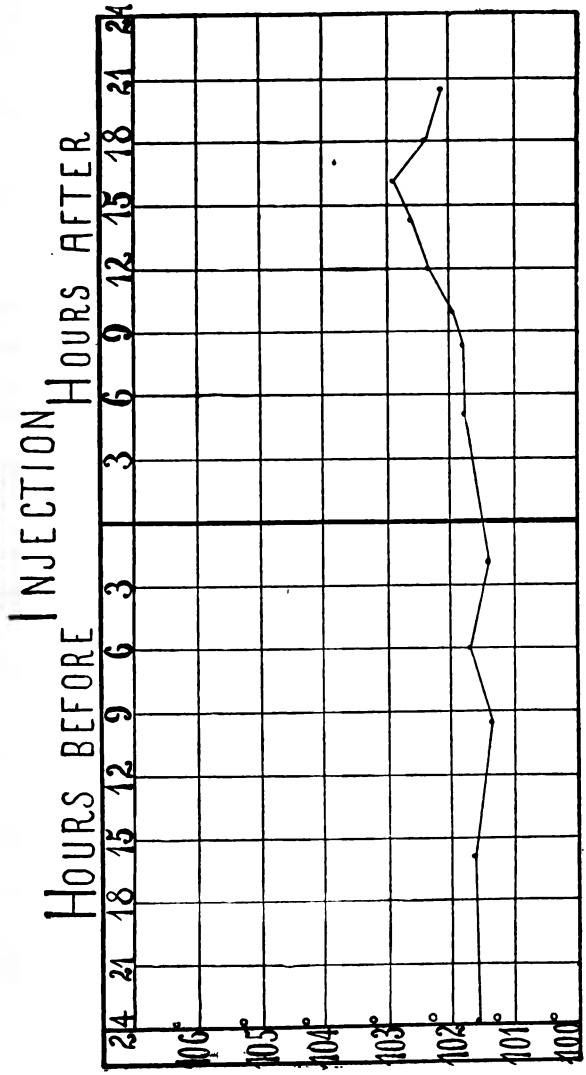

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CHART IV.

COMPOSITE TEMPERATURE CHART OF THIRTEEN ANIMALS SHOWING A REACTION WITH BUREA TUBERCULIN.

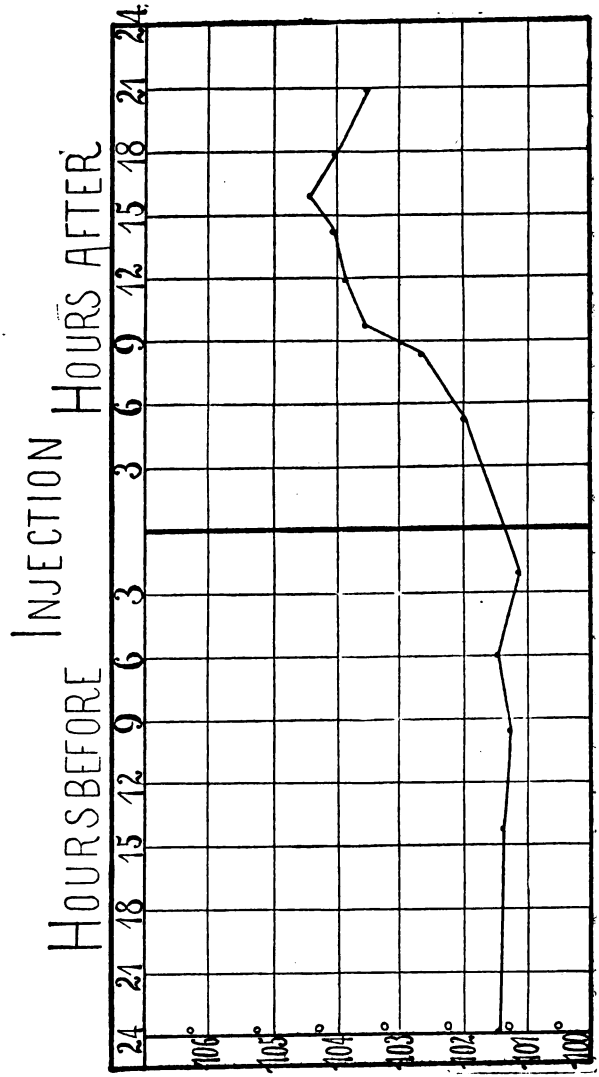

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Chart I. indicates the average temperature curve of all animals (10 in number) that showed no marked reaction fever when injected with imported tuberculin; chart II. gives the same for those animals (8) that did react, and were diagnosed as diseased.

Charts III. and IV. present similar records for the same animals when treated with the bureau tuberculin.

Arranged in this way, the marked difference in the reaction of a diseased and healthy animal is at once obvious.

As will be noted, the temperature begins to increase in about 5—9 hours, reaching the maximum in 16—18 hours and then falling gradually to the normal.

Careful inspection of the data given above will show that the imported tuberculin of Koch can be used with success in the first series of injections in very dilute solutions. Even with these minimal doses the reaction fever was quite as marked as it was with the much stronger bureau tuberculin. In all probability there is some slight difference in the strength of the fluid at different times, as the methods of preparation do not allow exact qualitative estimation. Continued experience with this agent will undoubtedly enable it to be applied more successfully in the future than it has in the past.

In Germany, where it has been tried most thoroughly, a compilation of the statistics concerning its use has been recently collated in which it is claimed that 85-88 per cent. of cases declared diseased, a correct diagnosis was made, and in about 90 per cent. of those diagnosed as free from disease, no lesions could be discovered even in a microscopic examination.*

COMPARISON OF TUBERCULIN TESTS WITH PHYSICAL EXAMINATION.

In order to prove the efficiency of the tuberculin tests as a diagnostic agent it was necessary to make a comparison with the physical diagnosis. The unsatisfactoriness of a physical examination in detecting this disease in its incipient stages has long been patent. Tuberculosis affects so many organs of the body that it is practically impossible to always separate the symptoms of this disease from those of a totally different origin.

* Landw, Wochenbl, für Schl. Hd. 1894, page 139,

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Dr. Clark made a careful physical examination of the eighteen animals that were in the comparative tests previous to the first inoculation. His report is embraced in table 3 (p. 204), and the details of the examination are grouped with the post-mortem accounts in following autopsy notes (p. 207). In only two cases (Daisy and Clothilde Rosa) did he find marked symptoms that led him to pronounce the animals undoubtedly tuberculous. Two other animals were also diagnosed as diseased although the symptoms were less marked, and four animals were noted as suspicious.

Reference to table 3 will show the instances in which the physical diagnoses were confirmed by the autopsy. Of the two animals that were regarded as unquestionably diseased one showed a generalized tubercular condition strongly manifested in the udder. The other animal (Daisy) was slightly tuberculous (one lymph gland), but an old pleurisy had misled the veterinarian in his physical examination. In all, six out of a possible sixteen were correctly diagnosed by the physical examination. The remainder of the herd that was later subjected to the tuberculin test was not closely examined by the veterinarian, but all of the animals were in apparent good health as far as could be noted upon a cursory examination. The superiority of the Koch test over a physical examination is thus demonstrated beyond all doubt.

If tuberculosis is a disease that should be eradicated because it is a menace to public health and to successful animal industry, we must be able to recognize it in its earliest stages as well as the more advanced cases. By means of the physical examination alone, this is manifestly impossible, but by the aid of the tuberculin test, we can at once determine in almost every instance whether the disease is present even in its earliest phases.

The objection is often urged that the tuberculin test is too delicate, that it detects a diseased condition before any danger can possibly arise from it. This objection is, in fact, one of the strongest points in its favor, for it enables a dairyman to know the actual condition of his herd, and to take such precautionary measures that will enable him to limit the possible spread of the disease.

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TABLE 3.—*Résumé comparing physical examination and tuberculin test with post-mortem results.*

No.	Name.	Physical diagnosis.	Reaction in Degrees Fahr.		Autopsy record.	Diagnosed Correctly by		
			With bureau tuberculin.	With imported tuberculin		Physical examination.	Tuberculin test.	
							Bureau.	Imported.
1	Polly	Sound	4.8	a2.9 (2)	Tuberculous		1	1
2	Bessein	Sound	1.6	1.4 (2)	Not killed			
3	Doubtful	Sound	1.7	0.8 (2)	Healthy	1	1	1
4	Gay	Suspicious	3.4	0.6 (2)	Tuberculous	1	1	
5	Aaggie, Neth. Beauty	Suspicious	4 3	1.5 (2)	Tuberculous	1	1	
6	Galena	Sound	3.7	0.8 (2)	Tuberculous		1	
7	Rue	Tuberculous	3.5 (2)	1.6	Tuberculous	1	1	
8	Neth. Nugget	Suspicious	3.5 (2)	2.8	Tuberculous	1	1	1
9	Daisy	Tuberculous	8.0	1.1 (2)	Tuberculous		1	
10	Bunn	Sound	2.1 (2)	0.6 (2)	Tuberculous		1	
11	Beauty	Tuberculous	1 3 (2)	1.6	Tuberculous			
12	Bessie 2d	Suspicious	3.8 (2)	3.1	Tuberculous		1	1
13	Palmyra	Sound	4.0 (2)	3.6	Tuberculous		1	1
14	Pansy	Sound	3.4 (2)	2.0	Tuberculous		1	1
15	Melvina	Sound	4.4 (2)	2 0 (?)	Tuberculous		1	1
16	Miss Cowslip 6th	Sound	1.2	1.4 2)	Not killed.			
17	Clothilde Rose	Tuberculous	b	2.0	Tuberculous	1		1

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18	Colantha Rosa	Sound	c 1.4 (2)	4.6	Tuberculous			1
19	Experimentalist	No examinati n	3.9 (2)	5.1	Tuber.u'ous		1	1
20	Lady Mos-coat	No examination		3.8	Tuberculous			1
21	Melrose	No examination		1.7	Tuberculous			1
22	Pet	No examination		0.0	Healthy			1
	CALVES.							
23	Galatea	No examination		2.6	Tuberculous			1
24	Melnotta	No examina'ion		3.8	Tuberculous			1
25	Rosette	No examination		3.1	Tuberculous			1
26	Nugget	No examinat on		3.8	Tuberculous			1
27	Blossom	No examination		4.4	Tuberculous			1
28	Augustus	No examination		2.5	Tuberculous			1
29	Chloe	No examination		3.1	Tuberculous			1
30	Josephine	No examination		0.0	Healthy			1
					Ratio of cases diagnosed correctly	6:16	14:15	21:28

a Figure two enclosed in parentheses as such (2) indicates the second inoculation.
b Animal died before second inoculation.
c Through an accident a part of dose was lost hence no reaction fever indicating disease.

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GENERAL DEDUCTIONS BASED UPON THE TEST, INCLUDING DETAILS OF AUTOPSY RECORDS.

In order to prove the reliability of the tuberculin test and compare it in efficiency with the physical diagnosis, it was necessary to sacrifice the entire herd,—not only those animals that had reacted but also those that had been declared healthy.

The expense of such a course is so great that private parties are rarely willing to suffer such pecuniary loss, but as our herd appeared to be so badly affected, it was deemed advisable to slaughter all those animals that had shown any disease reaction, and as many of the non-reacting animals as was deemed expedient.

Details from the autopsy notes are here given in order that the actual condition of each animal may be compared with the preliminary diagnoses and thus show more fully the reasons for the conclusions that will be drawn later.

In order to acquaint those who may not be familiar with the anatomical terms necessarily used in the autopsy notes, and the location of the organs that are usually attacked, the following brief resume of the course that the bacilli follow in their distribution throughout the body of the animal will serve to explain why certain organs and glands of the body are so often affected by the disease.

Course of the disease in animal body.—This disease, entering the system of the animal either by the way of the lungs or the intestinal tract, is found primarily in these organs or in the glandular lymphatic organs that are most closely connected with them. After once having gained an entrance into the animal body, it is spread usually by the way of the lymph channels (lymphatic circulation) or the blood vessels (vascular circulation). If the disease is contracted by the way of the air passages, the bacilli, passing the delicate cell lining (epithelium) of the air sacs and chambers, are often carried to the neighboring lymph glands and here held in check so that the disease is often localized in some of these glands such as the pharyngeal, those immediately above the pharynx, the bronchial, those situated at the division of the windpipe, the mediastinal, those located

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in the narrow space between the right and left lung sacs (mediastinum). Presence of diseased tissue in any of these glands with or without an affected condition of the lungs themselves may be taken to indicate that the disease was contracted through infection of air passages.

POLLY.—Grade Jersey; 18 months old.

History.—No trace of disease apparent, condition excellent, fat. Weight, February 20, 1894, 776 lbs.

Physical diagnosis.—Healthy.

Tuberculin test.—Marked reaction with both injections; February 20, Bureau tuberculin; March 22, imported brand.

Autopsy.—March 22; weight. 808 lbs. Left lung studded with small hard caseous tubercles, some of which were broken down into purulent matter. Submaxillary glands affected. Peritoneum over small intestine dotted with pearly protuberances, cheesy or calcareous.

Tubercles in lung seem to have developed with relation to circulatory system and not the bronchi. Bronchial glands healthy. Microscopical examination showed the infection to have been transmitted to the lymphatic circulation through the large follicles of mucous membrane of intestine.

DOUBTFUL.—Grade Jersey, 5 years old.

History.—Good.

Physical diagnosis.—Sound.

Tuberculin test.—Inoculated February 24 and May 2, 1894. No reaction in either case.

Autopsy.—May 9. No signs of tubercle on *post-mortem.*

GAY.—Registered Jersey, estimated 6 years old.

History.—Apparently healthy. Weight February 20, 871 lbs.

Physical diagnosis—Suspicious, slight thickening of submaxillary lymphatics. Crepitation over portion of left lung. Increased respiratory murmur at lower end of trachea

Tuberculin test.—February 20. reaction with domestic tuberculin. March 20, no reaction with imported tuberculin (only 28 days between injections).

Autopsy.—May 16, weight. 855 lbs. Single large abscess in intestinal wall (ileum). Several small pearly nodules on ileum and colon. Incipient tubercular spots in pharyngeal glands. Large, well-developed tubercle in right lung. Udder enlarged but flaccid, upon section tissue appears filled with small nodular masses, whitish in color. Few bacilli found in scrapings from inside of milk sinus.

AAGGIE NETHERLAND BEAUTY.—Registered Holstein, 5 years old.

History.—Animal always thin. Absolutely impossible to fatten when in lactation. Weight, February 23, 1,017 lbs.

Physical diagnosis.—Enlarged sub maxillary lymphatics. dullness on percussion over upper posterior part of right lung and slight crepitation. Suspicious.

Tuberculin test—Inoculated with Bureau tuberculin February 23. Strong reaction. Inoculated May 3 with imported tuberculin. Reaction 1.5 degrees Fahr.

Autopsy—May 12, weight 916 lbs. Pharyngeal glands filled with small tubercles, pin head in size. Mediastinal glands contain numerous small tubercles. Lesions apparently point to a recent infection.

GALENA.—Grade Jersey, estimated 5 years old.

Physical diagnosis.—Sound.

Tuberculin test.—Bureau tuberculin, February 23. Reaction. Imported tuberculin May 2. No reaction.

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Autopsy.—May 12, weight 911 lbs. Pharyngeal glands affected. Small tubercles found in mediastinal glands, several pearly tubercles in ileum.

RUE OF SILVER SPRINGS.—Registered Jersey, 10 years old.

History.—Good. Weight, March 12, 980 lbs.

Physical diagnosis.—Enlarged submaxillary lymphatics. Dullness on percussion and slight crepitation over upper posterior part of right lung.

Tuberculin test.—Inoculated March 13, with imported tuberculin. Reaction of 1.8 degrees Fahr. Inoculated May 2, with Bureau tuberculin. Marked reaction.

Autopsy.—May 14. Weight, 880 lbs. Mediastinal glands cheesy and calcareous. Right and left lung show several small tubercles. Number of pearly nodules in ileum.

NETHERLAND NUGGET.—Registered Holstein, 3 years old.

History.—Good Weight, March 12, 1,122 lbs.

Physical diagnosis.—Suspicious. Submaxillary glands enlarged. Increased respiratory murmur over portions of each lung.

Tuberculin test.—Inoculated with imported tuberculin March 12. Reaction. With Bureau tuberculin May 2. Reaction.

Autopsy.—May 15, weight 958 lbs. Several pearly nodules in the wall of ileum. In right lung two or three tiny tubercles. In left lung several large pneumonic areas.

DAISY.—Grade Jersey, 14 years old.

History.—Animal thin and emaciated but poor condition seems to be a family trait, for two generations on mother's side were always thin; heavy milkers. Weight, Feb. 20, 778 lbs.

Physical diagnosis.—Tuberculous. Thickening of submaxillary lymphatics. Dullness of percussion over considerable area of each lung; husky cough; heaving of flank. Increased resonance over portion of left lung. Bronchial breathing over lower anterior portion of left lung. Emaciated. Hide bound.

Tuberculin test.—Inoculated February 20. Gave reaction. 2d injection with imported tuberculin March 20. No reaction.

Autopsy.—March 22. Anterior mediastinal gland slightly enlarged; showed a few small tubercles on periphery. Tissue examined microscopically and bacilli demonstrated. Other organs showed no evidence of tuberculosis. Dullness of percussion due to an old pleurisy, therefore the physical diagnosis as tuberculous not warranted by evidence at autopsy.

BUNN.—Grade Holstein, 11 years old.

History.—Good. Weight, March 12, 1,260 lbs.

Physical diagnosis.—Sound.

Tuberculin test.—Inoculated March 12 with imported tuberculin. No reaction. Bureau tuberculin May 2. Reaction 2.1 degrees F.

Autopsy.—May 15, weight 1,150 lbs. One tubercle in posterior lobe of left lung. Numerous pearls in the wall of ileum. Inflamed areas in pharyngeal glands.

BEAUTY.—Native, estimated 12 years old.

History.—Good. Weight March 12, 1,120 lbs.

Physical diagnosis.—Dullness in percussion over posterior part of right lung Bronchial breathing over lower anterior part of right lung. Probably tuberculous.

Tuberculin test.—March 12, imported tuberculin. Reaction 1.7 degrees F. May 2, Bureau tuberculin. Reaction 1.3 degrees F.

Autopsy.—May 17, weight 982 lbs. Shows a healed-over tubercle in left lung; also a single pearly nodule in intestine. Several well marked tubercles in anterior mediastinal glands.

BESSIE 2D.—Grade Jersey, 7 years old.

History.—Rather poor in flesh. Weight March 12, 930 lbs. About April

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10 animal began to show signs of brain trouble and difficulty in standing or walking, ate but little. Weight April 12, 770 lbs. Milk decreased much in quantity (0.8 lbs per milking).

Physical diagnosis.—Suspicious. February 20, submaxillary gland slightly enlarged; crepitation over part of right lung.

Tuberculin test.—Reacted with imported tuberculin, March 13. Reacted upon second injection with Bureau brand, May 2.

Autopsy.—May 4, weight 694 lbs. Right lung diseased; showed a few large nodules, calcareous. Bronchial glands filled with numerous tubercles.

Marked changes in tissue of cerebellum although no bacilli could be demonstrated in sections of tissue.

PALMYRA.—Grade Jersey, 5 years old.

History.—Condition always good. Weight March 12, 906 lbs.

Physical diagnosis.—Given as sound. Slight crepitation over portion of right lung.

Tuberculin test.—Inoculated March 12, with imported tuberculin. Reaction. Second injection, May 2, with domestic tuberculin Reaction.

Autopsy.—May 15, weight 821 lbs. All of mediastinal glands badly affected, cheesy and calcareous. One tubercle in posterior lobe left lung. Numerous pearly protuberances from wall of ileum.

PANSY.—Grade Jersey, 2 years old.

History.—Animal fat and in excellent condition. Weight 816 lbs., March 12.

Physical diagnosis.—Sound.

Tuberculin test.—Injected March 13. Reaction fever of 2 degrees above normal with imported tuberculin; although only 1.7° above highest normal. 2d injection with Bureau tuberculin, May 2, gave a strong reaction.

Autopsy.—May 4, weight 795 lbs. Bronchial glands filled with tubercles. A few well marked nodules in each lung. A well defined but not a bad case. Lesions apparently recent.

MELVINA.—Registered Short Horn, 5 years old.

History.—Condition always good except a nasal catarrh which has been more or less severe for past three years. Weight 1,280, lbs. February 22.

Physical diagnosis.—Sound with the exception of above symptom.

Tuberculin test.—Bureau tuberculin, February 23. Marked reaction. Imported tuberculin May 2. Reaction.

Autopsy.—May 11, weight 1,240 lbs. Pharyngeal glands enlarged and calcareous. Mediastinal also contain numerous tubercles, many of which are broken down into abscesses. Numerous large abscesses and infiltrated areas in both right and left lung. Lesions point to an old chronic infection.

CLOTHILDE ROSA.—Registered Holstein. 5 years old.

History.—Animal in good health until December, 1893. Calf dropped December 24. Weight at this time 1,150 lbs. Began to lose in flesh from this date. Swelling on udder noticed about January 20. Became emaciated very rapidly. Weight March 13, 1,077 lbs. Inoculated at this date with tuberculin. Died April 3.

Physical diagnosis.—Tuberculous. Enlarged maxillary glands; dullness and crepitation over upper part of left lung Increased respiratory murmur at foot of trachea. Right hind quarter much enlarged and hard; mucous membrane pale; coat rough.

Tuberculin test.—Reaction fever present, although there was an abnormally high temperature before inoculation.

Autopsy.—April 3, weight 855 lbs. Abdominal peritoneal surface covered with net-work of fine tubercles following blood vessels. Peritoneum of wall covered with nodules. Bronchial glands much enlarged and filled with tubercles. Large clusters of nodules adherent to lungs and costal pleura (grapes) and also imbedded in tissue of lungs. Affected

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quarter of udder weighed 23 lbs.; a solid yellowish mass, calcareous, in few places. Microscopical examination showed a very acute generalized stage of the disease; bacilli present in milk in very large numbers. This instance shows the effect of calving on animals already affected with tuberculosis.

COLANTHA ROSA.—Registered Holstein. 18 months old.

History.—Good. Weight 933 lbs., March 12.

Physical diagnosis.—Sound.

Tuberculin test.—Injected with imported tuberculin March 12. Strong reaction. 2d injection, May 2, with domestic tuberculin (only 1.75 cc. injected. a part of dose accidently lost). Rise in temperature of 1.4 degrees Fahr.

Autopsy.—May 10, weight 955 lbs. Only tuberculous tissue found in animal was in left posterior mediastinal gland, which had a few discrete tubercles.

EXPERIMENTALIST.—Registered Jersey Bull. 3 years old.

History.—Presented when a young calf to the station by N. Y. Agricultural Experiment station. Weight 1,336 lbs., March 12.

Physical diagnosis.—Apparently sound, although detailed examination not made.

Tuberculin test.—Inoculated March 13, with imported tuberculin. Strong reaction. 2d injection with domestic tuberculin May 2. Reaction.

Autopsy.—Showed a badly affected chronic case. Pharyngeal and mediastinal glands well filled with calcareous tubercles. Both lungs showed numerous tubercles, hickory nut in size, imbedded in tissue; also several protruding from costal surface (grapes). Testis slightly affected.

LADY MOSSCOAT.—Short Horn. 2 years old.

History.—Daughter of Miss Cowslip 6th.

Tuberculin test.—Showed reaction of 2.7 degrees Fahrenheit.

Autopsy.—May 12. Mediastinal glands show a few small tubercles (pinhead in size). Acute inflamed areas in different lobes of both lungs. One or two small tubercles on ileum. Animal apparently infected recently by the way of the air passages.

MELROSE.—Short Horn. 18 months old.

Tuberculin test showed tuberculous condition of animal.

Autopsy.— May 11. Mediastinal glands were completely infiltrated, calcareous, cheesy, and in some cases purulent. One tubercular abscess, size of walnut, in right lung; also several smaller tubercles with acutely inflamed tissue surrounding them. Left lung slightly affected; one pearly nodule on ileum.

PET.—Ayrshire, 16 months old.

History.—Perfectly healthy.

Tuberculin test.—May 10, injected with imported tuberculin; no reaction

Autopsy.—In right lung was found one small healed tubercle completely encysted in a fibrous capsule.

GALATEA.—Grade Jersey, 5 months old.

History.—Daughter of Galena and Experimentalist. Kept housed in same barn with other stock since birth. Apparently in good health.

Tuberculin test.—Inoculated May 2 with imported tuberculin; reaction.

Autopsy.—One small tubercle in left lung. Left mediastinal gland (posterior) showed a few discrete tubercles; bronchial glands possessed inflamed areas. Abdominal viscera healthy.

MELNOTTA.—Short Horn, 4 months old.

History.—Apparently in good condition, with the exception of a thickening between bones of lower jaw. Kept in stable with remainder of herd since birth.

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Tuberculin test.—Injected with imported tuberculin, May 2; reaction.
Autopsy.—A large abscess enclosed in a fibrous capsule occupying space of pharyngeal gland. Mediastinal glands showed numerous tubercles some of which were calcareous and cheesy. Few small nodules in left lung. Intestines normal but mesenteric glands show numerous young tubercles.

ROSETTE.— Grade Jersey, 5 months old.

History.—Housed with herd since birth.
Tuberculin test.--Made with imported tuberculin, May 2; reaction.
Autopsy.—Incipient tubercles in right mediastinal gland; well developed masses in left mediastinal lymphatic glands. Slight nodular growths in a few of mesenteric glands; also numerous tiny tubercles in liver.
Post-mortem appearances would indicate a mixed source of infection.

NUGGET.—Registered Holstein, 6 months old.

History.—Housed in same barn with herd since birth.
Reaction with imported tuberculin, May 2.
Autopsy.—May 8. Superpharyngeal glands infiltrated and cheesy. Left anterior mediastinal studded with small hard tubercles. Several small tubercles in mesenteric glands.

BLOSSOM.—Grade Jersey, 5 months old.

History.—Housed with other animals.
Tuberculin test showed May 2 a strong reaction.
Autopsy.—May 12. Large abcess in pharyngeal gland. Mesenteric glands largely infiltrated with small-sized tubercles. Lungs healthy.

AUGUSTUS.—Holstein Bull, 6 months old.

Tuberculin test.—May 2, indicated tuberculosis.
Autopsy.—May 12. Right posterior mediastinal lymphatic full of small tubercles. Several pearly nodules on wall of ileum; also numerous young tubercles in mesenteric glands.

CHLOE.—Holstein, 4 months old.

History.—Daughter of Clothilde. Mother was tuberculous when with calf and rapidly wasted away with acute generalized stage of the disease. Udder markedly affected since calving.
Tuberculin test.—May 2, with imported tuberculin; reaction.
Autopsy.—May 12. Mesenteric glands filled with numerous nodules pinhead in size. Intestinal glands covered here and there with soft, young tubercles. Liver with several tuberculous areas scattered through tissue.
Unquestionably the calf must have been suckled on tuberculous milk from the very beginning.

JOSEPHINE.—Grade Jersey, 7 weeks old.

Tuberculin test indicated no disease.
Autopsy—May 12, showed no evidence of tubercular lesions.

In order that a more comprehensive idea may be obtained of the different organs affected, their relative frequency, and also to bring out more clearly the probable source of infection, the autopsy records of tuberculous animals are arranged in the following tabular form:

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TABLE 4.—*Showing distribution of disease in animals with probable source of infection.*

No.	Name.	Age.	Breed.	Pharyngeal and submaxillary lymph glands.	Bronchial and mediastinal lymph glands.	Lungs.		Intestines.	Mesenteric glands.	Other organs.	Probable source of infection.	General remarks.
						Right.	Left.					
1	Polly	18 mos	Grade Jersey.	T	T	.....	T	T	.....	.....	.....	Disease generalized, well developed.
4	Gay	6 yrs.	Jersey	T	.....	T(1)	.....	T	.....	Ud'r T	Pulmonary...	Widely distributed.
5	Aaggie	5 yrs.	Holstein	T	T	....	....	.....	.....	.....	Pulmonary...	Incipient stage.
6	Galena	5 yrs.	Grade Jersey.	T	T	.....	.....	T	.....	.....	Pulmonary...	Incipient stage.
7	Rue	10 yrs.	Jersey	.....	T	T	T	T	.....	.....	.....	Well developed case.
8	Neth. Nugget	3 yrs.	Holstein	.....	.....	T	.....	T	.....	.....	Enteric	Tubercles in lungs partially encysted.
9	Daisy	14 yrs.	Grade Jersey.	.....	T(1)	.....	.....	.....	.....	.....	Pulmonary...	Chronic case, localized.
10	Bunn	11 yrs.	Grade Jersey.	.....	.....	.....	T(1)	T	.....	.....	Enteric	Udder glands greatly enlarged.
11	Beauty	12 yrs	Native	.....	T	.....	T(1)	.....	.....	.....	Pulmonary...	Tubercle in lung encysted.
12	Bessie 2d	7 yrs.	Grade Jersey.	.....	T	T	.....	.....	.....	Liv. T	Pulmonary...	Acute in lungs; serious brain lesions.
13	Palmyra	5 yrs.	Grade Jersey.	.....	T	.....	T(1)	T	.....	.....	Pulmonary...	Chronic.
14	Pansy	2 yrs.	Grade Jersey.	.....	T	T	T	.....	.....	.....	Pulmonary...	Well defined but recent case.
15	Melvina	5 yrs.	Short Horn...	T	T	T	T	.....	.....	.....	Pulmonary...	Numerous abscesses in lungs; old case; bad.
17	Clothilde Rosa	5 yrs.	Holstein	.....	T	T	T	T	T	Ud'r T	.....	Acute generalized case; tuberculous throughout.
18	Colantha Rosa	19 mos	Holstein	.....	T	.....	.....	.....	.....	.....	Pulmonary...	Recent infection.
19	Experim'ntalist	3 yrs.	Jersey bull	T	T	T	T	.....	.....	Testis T	Pulmonary...	Bad case; chronic.
20	Lady Mosscoat	2 yrs.	Short Horn...	.....	T	T(1)	T	T	.....	.....	Pulmonary...	Acute type; recent.
21	Melrose	18 mos	Short Horn...	.....	T	T	T	T(1)	.....	.....	Pulmonary...	Well developed case.

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23	Galatea	6 mos	Grade Jersey.	.....	T	.....	T(1)	.....	.....	....	Pulmonary...	Recent infection.
24	Melnotta.....	4 mos	Short Horn...	T	T	. ...	T	.....	T	.....	Pulmonary...	Large abscesses in pharyngeal lymph gland
25	Rosette.....	5 mos	Grade Jersey.	.....	T	T	.....	... ...	T(1)	Liv. T	Mixed	Thoracic cavity badly affected.
26	Nugget.....	5 mos	Holstein . ..	T	T	.....	.....	.....	T	.....	Mixed	Strongly developed in thorax.
27	Blossom.....	6 mos	Grade Jersey.	T	... .	.....	.....	.....	T	. .....	Mixed	Abscesses in pharyngeal lymphatics.
28	Augustus.....	6 mos	Holstein.....	.....	T	.....	.....	T	T	.. ...	Mixed.	Incipient case.
29	Chloe	4 mos	Holstein.... .	....	T	.....	.....	T	T	Liv. T	Enteric.....	Derived from suckling diseased mother.
Per cent. of cases in which various organs were diseased.....				36 p. ct.	81 p. ct.	44 p. ct.	52 p. ct.	48 p. ct.	28 p. ct.			
Per cent. where lungs were affected				.....		68 p. ct.						
Per cent. showing infection by air passages and intestinal canal.....				100 p. ct.				64 p. ct.				

(1) A single tubercle found in affected organ.

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A consideration of the table leads to the recognition of several facts that are of more or less interest in this connection.

1st. Relative frequency with which the different organs are affected.—The percentage relations indicated at the bottom of the table give the proportion of cases in which the various organs were diseased. This shows that the lymphatic glands of mediastinum and bronchi succumbed more frequently than the lungs, as 80 per cent. of all diseased animals had either one or both sets of these lymph glands affected, while 69 per cent. were diseased in one or both lungs.

If the animals that were affected in the abdominal organs are grouped in a similar manner, there are 16 cases out of a possible 26, or over 60 per cent. that show intestinal infection.

It does not necessarily follow, however, that in this percentage of cases, the disease was contracted in all cases through food or drink, for it is quite possible that an animal badly affected in the thoracic cavity might discharge purulent matter from disintegrating abscesses and this material pass into the digestive tract and thus set up a secondary intestinal infection. In some instances the diseased tissues in the lung cavity and adjoining organs indicated a more recent infection than those found in intestine and mesentery.

If the disease enters by the way of the digestive tract, it may result in the formation of tubercles in the membranes of the intestine, either in the muscular or mucous coats or on the thin, smooth, outside membrane (peritoneum). These tubercles often protude from the surface and have a pearly appearance, hence the name "pearl" disease. If the bacilli are absorbed by the intestinal lymphatics, they may often pass the intestinal coats and lodge in the lymph glands of the mesentery and there develop tubercular deposits. If instead of being absorbed by the lymphatic vessels, they find their way into the veins, the course of the disease will be much different. They are then carried toward the heart through the liver and spleen, where tubercular areas may be set up in these organs. Tuberculosis is preferably a disease that is distributed by the lymph circulation and for this reason it is localized in organs and vessels rich in lymphatic fluids.

Such a preponderance of cases showing undoubted pulmonary

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infection indicates strongly the danger that closely-housed animals undergo, if the disease is once introduced into their midst. Close confinement in itself can not produce tuberculosis, neither can insufficient ventilation, filth, or any other unsanitary condition, but each factor can and undoubtedly favors the contraction of the disease if the all essential germ is present. They prepare the soil to receive any chance seed that may happen to fall therein.

The percentage results as indicated in the above autopsy table do not differ materially from the usual average. Rockl gives the post-mortem returns of over 7,300 cases of tubercular cattle slaughtered in Germany in the year 1888, in which the disease was present in the lungs in 75 per cent. of the entire number, while the mesentery and peritoneum of the abdominal cavity were affected to the extent of 48 per cent. Covering as these statistics do returns from a large number of autopsies, they indicate the relative importance of the two methods of infection with cattle and show that the danger from the air is very much greater than it is from the absorption of the disease germs by means of the food and drink.

2. The disease in respect to the age of animals.—In the epidemic that we have under consideration the usual ratios that are found in diseased animals of different ages are completely lost. Here it practically swept through the entire herd and no age-class is exempt. In this connection it may be worth noting the distribution of the disease as determined by compiled statistics.

Reports of over 50,000 diseased animals in Rockl's report show the following distribution of the disease according to age:

Under six weeks	0.4 per cent.
Six weeks to one year	0.6 per cent.
One year to three years	11.4 per cent.
Three years to six years	33.1 per cent.
Six years and over	43.4 per cent.
Age undetermined	11.2 per cent.

In other words the percentage of diseased animals usually increases with the age of the animal. In the light of these general facts the autopsy notes on the younger stock of our herd have an increased interest. Especially is this so with reference

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to the calves. If calves are separated from the remainder of the herd or allowed to run with their mothers in the open field the chance of contracting the disease through the lungs and air passages is reduced to a minimum. Under these conditions, if the animal acquires the disease, the possibility of enteric infection is proportionately increased, for, if the mother is affected, and especially if the disease is localized in the udder of the animal, the bacilli may pass directly into the intestines of the suckling calf and so infect the offspring. Such is undoubtedly the course of infection in a four-months-old calf of our herd named Chloe. The disease in this animal originated primarily in the intestinal tract. Its mother Clothilde was in apparent good health until the calf was dropped when she began immediately to "run down," wasting rapidly away, and soon developed a marked case of tuberculosis of the udder. A microscopic examination of the milk revealed the presence of the tubercle bacilli and a rabbit inoculated with a small quantity of the milk died in the course of seven weeks. The subsequent development of the disease in the intestines of her calf strongly indicate a direct transmission of the disease from mother to offspring by means of the milk.

The history of the eight calves in above table is as follows: They varied in age from seven weeks to six months. All of them had been confined since birth in the same stable with the remainder of the herd, and at the same time had been fed upon the milk of several cows that later were found to be tuberculous. Every one except the youngest animal, Josephine, seven weeks old, proved to be markedly diseased when slaughtered. In two cases, Blossom and Melnotta, enormous abscesses were found in pharyngeal glands. In one instance the abscess had broken and an offensive purulent discharge was noted at the nostril. Five of them were more or less diseased in the abdominal organs, indicating a probable contamination from infected food or drink. As the milk is now known to have contained germs of this disease there is hardly any question but that the intestinal infection was due to the milk fed them during this short period. The record of the infection of the air passages speaks for itself. No other commentary is needed to point out the danger that may be present when seven ani-

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mals out of eight, in a period varying from four to six months can contract the disease.

The objection may be urged that there is a possibility that these calves inherited the disease or received it from a diseased mother in utero. This opens up the question of the heredity of tuberculosis, a subject on which there has been much dispute and one in which the popular belief is quite at variance with the scientific facts gathered from close observation and experiment.

The actual inheritance of this disease in the offspring of affected parents has as yet never been absolutely proven. The possibility that the disease may be transmitted from an affected mother direct to the foetus by some wound in the foetal membranes is much more probable, yet the actual occurrence of this is so rare, that it may be practically disregarded.

Another possible source of the disease is the infection of the embryo during conception. A diseased condition of generative organs of either parent may possibly infect the embryo, but the fact that cows affected with uterine tuberculosis usually abort their young, lessens the possibility that a considerable number of calves are actually born with the disease established at birth.

The epidemic as present in our station herd is an extremely severe type of the disease, and the percentage of animals affected (87 per cent.) is undoubtedly higher than would be found in any considerable number of herds throughout the state. No new purchases of animals have been made on the station farm within the past three years so the disease was in all probability introduced prior to this date. The general condition of our herd at the time that the tuberculin test was first proposed was very fair. We had had no recent deaths and only one animal, Clothilde, showed any unmistakable signs of the disease and she was in apparently good condition five months previous. Still we see how easy it was to be misled. Here was a herd of thirty animals from good to fair condition with one exception, and yet twenty-six of the thirty had within them the germs of the disease, several cases of which were of a chronic type while many more were of an incipient nature and as yet not especially dangerous. Still the infective material was being so abundantly

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distributed that every calf on the farm over four months of age was stricken with the disease.

Data like this are doubtless on the whole misleading, for it is highly improbable that such a percentage of diseased animals exist in many cases, but it shows how general an epidemic may become if the disease is once introduced into a herd.

In dealing with this question of bovine tuberculosis in relation to public health and to animal industry, it will be necessary to proceed with care and caution. Bad as the case may be it will be impossible for it to be much worse in the immediate future than it has been in the recent past, so there is no necessity for increased alarm on the part of the general public. An unwarranted panic of this sort would unjustly cause such a set back to the dairy industries of this state that they might not recover from in years.

Still it behooves us as consumers and producers as well, to face this question fairly. Monetary influences have no right to outweigh sanitary considerations and if it is true that the spread of this disease in dairy cattle increases in any considerable degree, the chance for infection in young children and those with impaired digestive organs, then it is sheer presumption on our part to attempt to repress the facts in the case or to throw this subject aside with a passing thought.

We have noted in the foregoing pages data showing the prevalence of the disease in other sections. Our own herd has shown an alarming epidemic in progress for some time without our recognizing it in any way whatever. Undoubtedly the disease is not so prevalent in the average dairy herd in our state. Possibly the percentage may not be as great as it is in other states like New York. The dairy industry of Wisconsin has not been established so long as it has in the older eastern states and in Europe. As the disease seems to be spread most largely by the introduction of blooded stock, it is reasonable to presume that it is not so thoroughly distributed in the west as it is in the older eastern sections. This is only a supposition and its worth can only be attested by extensive trials of the tuberculin test in our own herds. Only in this way can Wisconsin dairymen determine to what extent tuberculosis is in their midst. If the

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percentage of diseased animals is relatively small, is it not much better for us to find this out at once? Then in the light of this knowledge, we can take immediate steps to limit the possibility of the distribution of the disease and thus save much to the dairy industries of the state. Does not financial prudence alone dictate such a course of action?

CONCLUDING REMARKS.

Recognizing the contagious nature of tuberculosis among our domestic animals and the transmissibility of the disease from the products of the animal to man, the importance of using great care in the inspection of our herds is at once apparent.

While all animals afflicted with the disease in its various stages may not be the means of actually spreading the malady, yet it is plainly evident that in consideration of our inability to recognize just when the diseased animal becomes a source of positive danger, the only safe means of procedure is to exclude all animals known to be infected from contact with healthy ones and their products as human or animal food unless they are previously freed from their infectious properties. Common experience also indicates the futility of recognizing the earlier stages of the disease in cattle and consequently the execution of the above conditions has been heretofore rendered impossible.

The introduction of the tuberculin of Koch as a diagnostic agent in detecting bovine tuberculosis, even in its most incipient stages, has, however, been attended with such evident success that we now recognize in it a most valuable aid in detecting the disease. Experience in Germany and other European countries has demonstrated the efficiency of this agent in doing what a physical examination accomplishes in a very imperfect and incomplete manner. This experience has been fully corroborated by our own experiments and those of other experiment stations as well as the boards of health of other states.

These tests have demonstrated the high value that is to be attached to the use of this material as a diagnostic agent and also have shown that the disease known as tuberculosis is

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more prevalent than had ever been supposed. We have then in this agent a means of detecting the disease if we desire. The question now arises, What shall be our course?

As to the conditions of the future, the efficacy of the tuberculin test is such that a great deal of financial loss can doubtless be averted and public health benefited to a certain extent.

The use of this agent is to be recommended,

1st. In herds used for a general milk supply as here is the main source of danger. Products manufactured from milk that may contain limited numbers of bacilli are much less to be feared than the milk itself. Laboratory experiments have demonstrated that in order to produce the disease even in the smaller animals like the rabbit it requires the introduction of a goodly number of germs. Wyssokowitsch found that from 20 to 30 bacilli were necessary to set up a diseased condition in a rabbit even when they were injected directly into the veins. When animals are fed on tuberculous milk it requires a much larger number, and even then failure to infect is often the result. Therefore the probability of a sufficiently large number being incorporated into butter or cheese is so small as to reduce this chance for infection to a minimum.

With the consumption of milk and possibly cream the question is quite different. Dilution of the milk of a single tuberculous animal with that of an otherwise healthy herd would doubtless reduce the probability of infection very greatly as has been repeatedly proven, but no one desires to risk a possible chance of infection where human life is at stake. For this reason it is highly essential that dairymen at least should adopt the tuberculin test as a guarantee to their patrons that there is no possible chance of disease lurking in their herds.

2d. In dairies producing milk intended for children and invalids. The immature system of the child or the enfeebled one of the invalid are unquestionably more susceptible than that of the vigorous adult. Hence the importance of this question to consumers under these conditions. A demand on their part can now be met with comparative ease on the part of the dairyman. How long we shall go on without this guarantee of purity from this disease depends entirely upon the demand of the consuming public.

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3d. In the purchase of new animals.—Not only is it an element of far sightedness to insist that valuable stock must satisfactorily pass the tuberculin test, but all stock that is purchased should be as closely scrutinized. A grade or a native may introduce the disease into your herd quite as easily as a full-blooded animal. From a historical standpoint it is undeniably true that the high-grade stock have been the chief means of distributing the disease, but it has been largely because transfers of stock have been mainly confined to this class. It is possible that other factors may have increased the percentage of diseased animals in this class out of proportion to the ordinary native breeds, but one fact may be considered certain, that if a herd is once freed from the disease and the sanitary surroundings are maintained as they should be, there is practically but little danger to be feared if all stock brought into the herd is subjected to the test.

These suggestions present themselves with reference to the subject in the future. A course of action based upon the satisfactory examination by means of the test of every animal introduced into the herd must, however, be founded upon an assurance that all of the old herd is absolutely free from the disease, for it is possible that the trouble may already be present and break out at any time in the future even though the stock introduced may be entirely free. To do this with every herd in the state would be a formidable task and yet there is no other way that so surely enables us to separate the healthy from diseased animals. A work of this magnitude cannot be accomplished in a brief period, but the most feasible plan is to inaugurate the use of the test in the finer herds first. Those that are the most valuable from a financial standpoint, and especially those from which sales are often made, should be the first to be tested. The time is not far distant, indeed it has already come in some sections, where enterprising breeders will test their own herds gladly for the value of the guarantee which they would be able to give with each animal sold from their stock. When buyers insist upon such a guarantee it will soon be possible to check the distribution of affected animals.

We must, however, as breeders and dairymen not forget that hygienic conditions have much to do with the spread of the

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malady, and that the tuberculin test alone will not permanently exempt our herds from the disease. A more thorough knowledge of the conditions under which the disease is propagated in cattle will enable many stock growers to see where their methods may be at fault. This subject is however hardly germane to our present discussion, and consequently must be omitted.

What shall be done with tuberculous animals?—The question as to what must be done with our tuberculous animals is one that comes inevitably to the fore as a logical sequence of the use of the tuberculin test. The question will undoubtedly be asked: Is it necessary to slay all animals that show a diseased condition by the test? In our own experience, we have always found that the reacting animals when killed showed evident lesions of the disease, but in many cases they were of such a nature that no possible harm would have originated from the use of their milk for some time to come, and possibly not at all. So far as we can determine at present, probably not more than three out of the twelve milch cows that were diseased had tubercle bacilli present in their milk. Inoculation experiments upon animals are not as yet completed, but in two instances, bacilli were demonstrated in the milk. The New York state board of health, backed by legislative enactments, is endeavoring to extirpate the disease by condemning and slaughtering all diseased animals. Such a course of procedure ought to prove efficacious; but unless the question of compensation is satisfactorily adjusted, considerable friction is apt to occur between the state authorities and the stock owners.

Until action upon this question is brought about through legislative means, might it not be wise instead of slaughtering all animals that showed any disease reaction with the test to isolate and quarantine such stock? Of course those animals that show evident signs of the disease should be slaughtered at once, but in many instances animals might be made productive for a considerable time and under favorable conditions possibly recover from the disease. Such a course of action is not at all impossible. In our better hospitals, consumptives are now isolated and kept under conditions that limit to the greatest possible extent all danger of infection. At any rate the isolation of all reacting animals and the disinfection of infected quar-

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ters would doubtless stop the continual spread of the malady throughout whole herds.

It is a well known fact that tubercular troubles in man and animals often heal over entirely. The slaughter of animals and post-mortems on persons dying from other causes often show the presence of tubercular lesions that have apparently been permanently healed. By a rigid quarantine and careful watch over the hygienic surroundings, the course of the disease might in many instances be checked and a possible cure affected.

Those animals that have the disease in the earlier stages could also be made productive to a certain degree. The milk of some of them might possibly contain a few and often no bacilli, but it is possible to so treat it that the germs would be entirely destroyed and still the milk not harmed for many purposes. If the milk was subjected to the process of pasteurization, i. e., heated to the temperature of 150 degrees to 155 degrees F., the germs would be completely destroyed without in any way harming the quality of the milk. This plan is only suggested in outline and it would require considerable elaboration, yet it would in a sense meet the financial objection that is so potent. If we can in some such way as this gradually weed out the disease from herds already infected it would no doubt meet with more cordial support than an attempt to eradicate the disease by the use of extreme measures. Questions of this nature, however, can only be intelligently discussed when we know how universal the disease is in our Wisconsin herds, and to find this out the use of the tuberculin test is to be most strongly recommended as an aid in diagnosing the disease in cattle.

NOTE.

Immediate measures of relief to consumers of milk.—Consumers of milk are not entirely dependent upon the action of dairymen in furnishing them with a product guaranteed to be free from the virus of consumption. While a demand on the part of the consuming public will undoubtedly be responded to with alacrity by enterprising dairymen, yet it is no easy matter to test all herds that are used for milk supplies. Considera-

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ble time will be required before even the suggestions offered in the foregoing bulletin can be carried out. In the meantime, each consumer can protect himself as far as his own milk supply is concerned with comparative ease.

The process of pasteurization, or the heating of milk for a period of 20-30 minutes to a temperature somewhat below that of the boiling point (about 155 degrees F.,) will eliminate all disease germs and milk so treated will retain its sweetness, if properly cooled, for a considerable longer period of time than is ordinarily the case.

The application of this process to the milk used by individual families can be easily made, a good thermometer being the only extra piece of apparatus that an ordinary kitchen does not possess.

Details of this process cannot be given in this connection, but any physician can easily advise in this matter. This suggestion is offered to those that may have any anxiety as to the purity of their milk supply, as a cheap and ready way of insuring safety in their own households from any dangers that might occur from the use of milk contaminated with the seeds of this disease.

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